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1918/19

Univ. of Minnesota

Medical School

Graduate

1918-1919

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# *The Bulletin of the University of Minnesota*

*The Graduate School  
Announcement of Graduate Work  
in Medicine in the Medical School  
and the Mayo Foundation  
1918 - 1919*

~~REF. DIV.~~  
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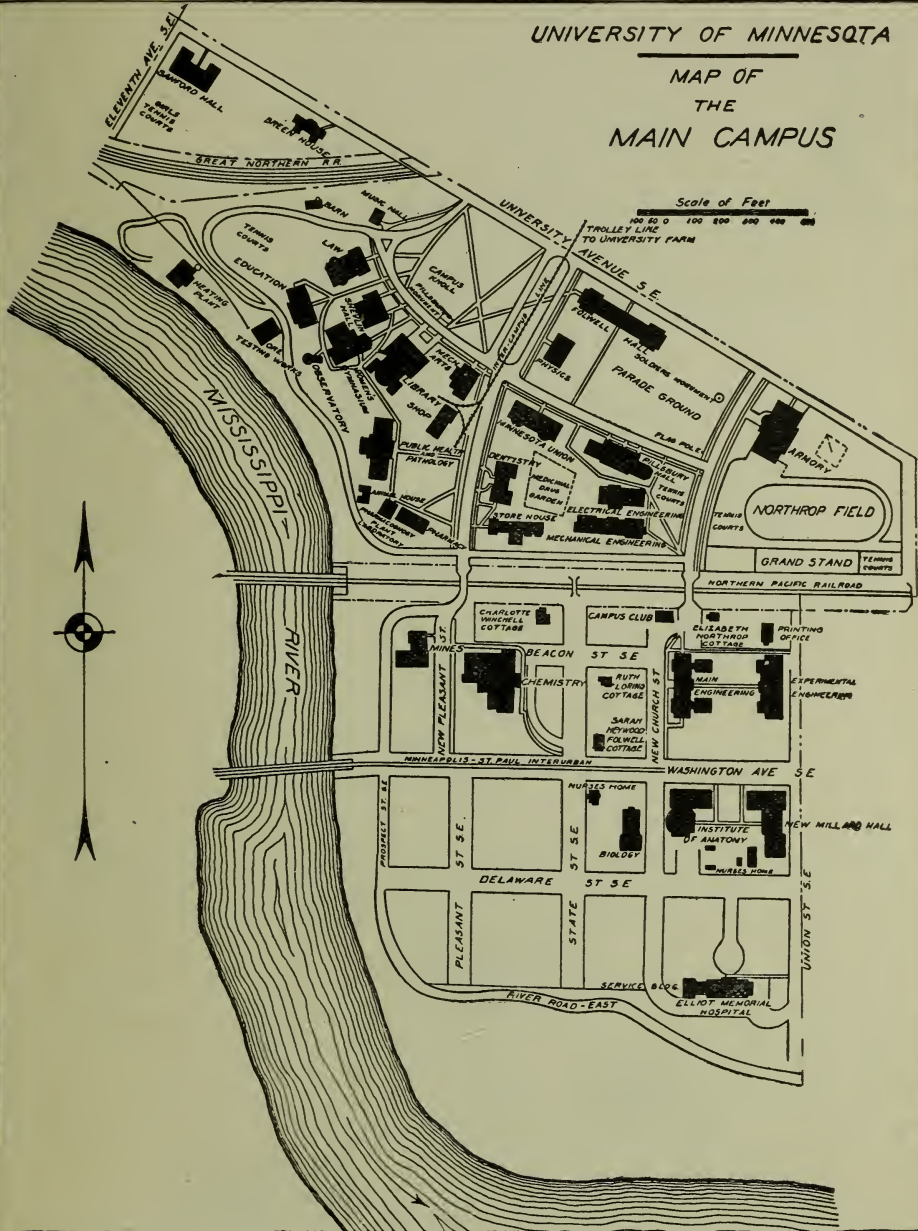
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Act of October 3, 1917, authorized July 12, 1918*

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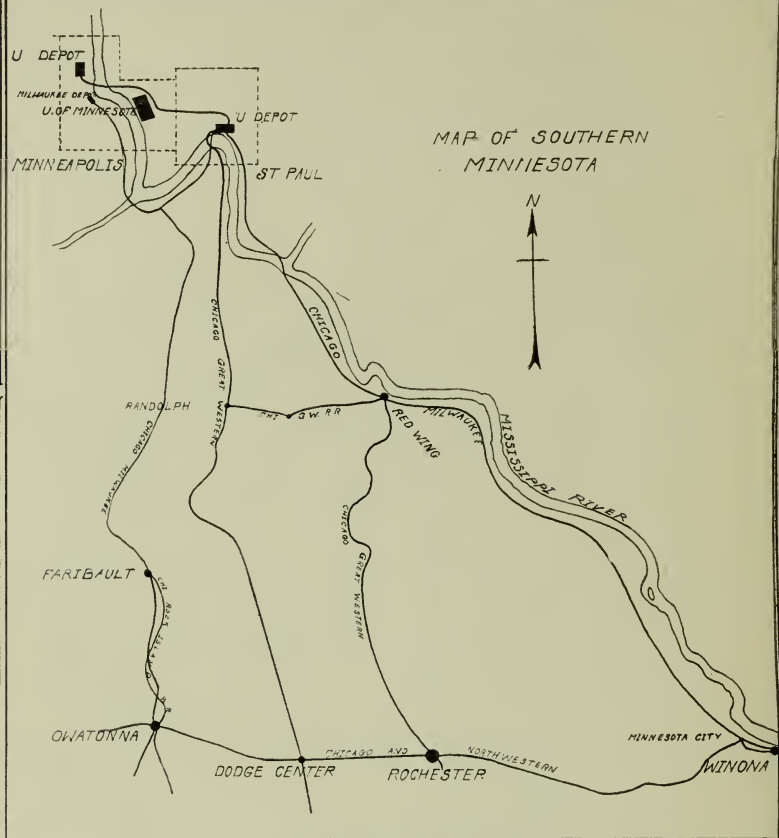
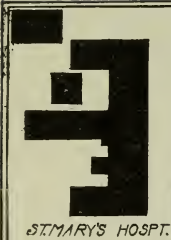
# UNIVERSITY OF MINNESOTA

## MAP OF THE MAIN CAMPUS

Scale of Feet  
100 200 300 400 500 600 700 800



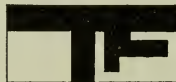
Area of Main Campus, 108.5 acres



ZUMBARD STREET (9 BLOCKS)



MAP OF A PORTION OF ROCHESTER SHOWING  
MAYO CLINIC, HOSPITAL AND SANITARIUMS



MAYO CLINIC

FRANKLIN STREET

SURGEONS CLUB

SHOP

MAIN STREET

COLONIAL SANITARIUM





# UNIVERSITY CALENDAR

(As Applicable to Graduate Work in Medicine)

1918-1919

The University year for fellows doing graduate work in clinical medicine looking toward an advanced degree covers a period of fifty-two weeks, less two or three weeks' vacation to be arranged by the head of the department in which the student is working. In the fundamental laboratory branches in the Medical School, the academic year of nine months is followed.

1918

August	1	Thursday	First semester (first quarter) begins for the Mayo Foundation. Nominations of fellows on the Mayo Foundation, service to begin February 1, 1919.
September 17-24		Week	Registration and payment of fees for new students.
September	25	Wednesday	First semester begins at the Medical School.
October	5	Saturday	Last day for registration of graduate students for the first semester.
November	1	Friday	Nominations of fellows on the Mayo Foundation, service to begin May 1, 1919.
November	15	Friday	Last day for filing at the Dean's office thesis subjects for the Master's degree.

1919

January	20	Monday	Registration for second semester closes, except for new students.
February	1	Saturday	Nominations of fellows on the Mayo Foundation, service to begin August 1, 1919.
February	3	Monday	Second semester begins.
March	1	Saturday	Last day for filing applications for the Shevlin Fellowship in Medicine.
April	1	Tuesday	Nominations of teaching fellows in the Medical School, service to begin August 1, 1919.
May	1	Thursday	Nominations of fellows on the Mayo Foundation, service to begin November 1, 1919.
May	1	Thursday	Last day for filing at the Dean's office three copies of theses submitted for the Master's or Doctor's degree.

May	8	Thursday	Last day for written examinations, in the field of the major, of candidates for the Master's or Doctor's degree.
May	22	Thursday	Last day for final oral examination of candidates for the Master's or Doctor's degree.
June	4	Wednesday	Alumni Day.
June	5	Thursday	Forty-seventh annual commencement.
June	16	Monday	University Summer Session begins.

# GRADUATE WORK IN MEDICINE

## ORGANIZATION

The graduate work in medicine in the Medical School and the Mayo Foundation is a part of the work of the Graduate School of the University. Its management is entrusted by the Board of Regents to a committee composed as follows:

The President of the University, MARION LeROY BURTON, Ph.D., D.D., LL.D.

The Dean of the Graduate School, \*GUY STANTON FORD, Ph.D.

The Dean of the Medical School, ELIAS POTTER LYON, Ph.D., M.D.

The Director of the Mayo Foundation, \*LOUIS B. WILSON, M.D.

LEONARD G. ROWNTREE, M.D., Sc.D., of the Medical School

JAMES E. MOORE, M.D., of the Medical School

CLARENCE MARTIN JACKSON, M.S., M.D., of the Medical School

JENNINGS C. LITZENBERG, B.S., M.D., of the Medical School

DONALD C. BALFOUR, M.D., of the Mayo Foundation

WILLIAM FREDERICK BRAASCH, B.S., M.D., of the Mayo Foundation

MELVIN STARKEY HENDERSON, M.D., of the Mayo Foundation

## FACULTY

MARION LeROY BURTON, Ph.D., D.D., LL.D., President

\*GUY STANTON FORD, Ph.D., Dean of the Graduate School

DONALD C. BALFOUR, M.B., M.D., Associate Professor of Surgery (Mayo Foundation)

RICHARD O. BEARD, M.D., Associate Professor of Physiology

ELEXIOUS T. BELL, B.S., M.D., Associate Professor of Pathology

WILLIAM L. BENEDICT, M.D., Assistant Professor of Ophthalmology (Mayo Foundation)

\*WAYNE W. BISSELL, B.S., M.D., Assistant Professor of Pathology (Mayo Foundation)

\*WALTER M. BOOTHBY, M.A., M.D., Assistant Professor of Medicine (Mayo Foundation)

WILLIAM F. BRAASCH, B.S., M.D., Professor of Urology (Mayo Foundation)

EDGAR D. BROWN, Ph.D., M.D., Associate Professor of Pharmacology

FRANK E. BURCH, M.D., Assistant Professor of Ophthalmology and Otolaryngology

RUSSELL D. CARMAN, M.D., Professor of Roentgenology (Mayo Foundation)

\*J. FRANK CORBETT, M.D., Associate Professor of Experimental Surgery

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\* Absent on leave.

- GEORGE B. EUSTERMAN, M.D., Assistant Professor of Medicine (Mayo Foundation)
- \*CARL FISHER, B.S., M.D., Associate Professor of Ophthalmology and Otolaryngology (Mayo Foundation)
- \*EMIL S. GEIST, M.D., Assistant Professor of Orthopedic Surgery
- HERBERT Z. GIFFIN, B.S., M.D., Associate Professor of Medicine (Mayo Foundation)
- ARTHUR J. GILLETTE, M.D., Professor of Orthopedic Surgery
- CHRISTOPHER GRAHAM, B.A., D.V.M., M.D., Professor of Medicine (Mayo Foundation)
- ARTHUR S. HAMILTON, M.D., Professor of Mental and Nervous Diseases
- ERNEST M. HAMMES, M.D., Assistant Professor of Mental and Nervous Diseases
- THOMAS B. HARTZELL, D.D.M., M.D., Research Professor in Mouth Infections
- MELVIN S. HENDERSON, M.B., M.D., Associate Professor of Orthopedic Surgery (Mayo Foundation)
- ARTHUR D. HIRSCHFELD, B.S., M.D., Professor of Pharmacology
- CLARENCE M. JACKSON, M.S., M.D., Professor of Anatomy
- JOHN B. JOHNSTON, Ph.D., Professor of Comparative Neurology
- EDWARD S. JUDD, M.D., Associate Professor of Surgery (Mayo Foundation)
- EDWARD C. KENDALL, Ph.D., Associate Professor of Biochemistry (Mayo Foundation)
- \*FRANCIS B. KINGSBURY, Ph.D., Assistant Professor of Physiologic Chemistry
- WINFORD P. LARSON, M.D., Associate Professor of Bacteriology
- \*ARTHUR A. LAW, M.D., Associate Professor of Surgery
- THOMAS G. LEE, B.S., M.D., Professor of Comparative Anatomy
- HAROLD I. LILLIE, B.A., M.D., Assistant Professor of Otolaryngology, Rhinology, and Laryngology (Mayo Foundation)
- JENNINGS C. LITZENBERG, B.S., M.D., Professor of Obstetrics and Gynecology
- ARCHIBALD H. LOGAN, M.D., Associate Professor of Medicine (Mayo Foundation)
- ELIAS P. LYON, Ph.D., M.D., Professor of Physiology
- \*JESSE F. MCCLENDON, Ph.D., Associate Professor of Physiology
- WILLIAM C. MACCARTY, M.S., M.D., Associate Professor of Pathology (Mayo Foundation)
- ARTHUR T. MANN, B.S., M.D., Associate Professor of Surgery
- FRANK C. MANN, M.A., M.D., Associate Professor of Experimental Surgery and Pathology (Mayo Foundation)
- JAMES C. MASSON, M.D., Assistant Professor of Surgery (Mayo Foundation)

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\* Absent on leave.



- CHARLES H. MAYO, M.A., M.D., D.Sc., LL.D., Professor of Surgery (Mayo Foundation)
- \*ALEXANDER B. MOORE, M.D., Assistant Professor of Roentgenology (Mayo Foundation)
- JAMES E. MOORE, M.D., Professor of Surgery
- WILLIAM R. MURRAY, Ph.B., M.D., Associate Professor of Ophthalmology and Oto-Laryngology
- \*ROBERT D. MUSSEY, M.D., Assistant Professor of Medicine (Mayo Foundation)
- GORDON B. NEW, D.D.S., M.B., M.D., Assistant Professor of Rhinology, Laryngology, and Stomatology (Mayo Foundation)
- HORACE NEWHART, B.A., M.D., Assistant Professor of Ophthalmology and Oto-Laryngology
- CHAUNCEY J. V. PETTIBONE, Ph.D., Assistant Professor of Physiologic Chemistry
- HENRY S. PLUMMER, M.D., Professor of Medicine (Mayo Foundation)
- ANDREW T. RASMUSSEN, Ph.D., Assistant Professor of Neurology
- \*HAROLD E. ROBERTSON, B.A., M.D., Professor of Pathology
- EDWARD C. ROSENOW, M.D., Professor of Experimental Bacteriology (Mayo Foundation)
- LEONARD G. ROWNTREE, M.D., D.Sc., Professor of Medicine
- ARTHUR H. SANFORD, M.A., M.D., Associate Professor of Clinical Bacteriology and Parasitology (Mayo Foundation)
- RICHARD E. SCAMMON, Ph.D., Professor of Anatomy
- FREDERICK H. SCOTT, Ph.D., M.B., D.Sc., Professor of Physiology
- JULIUS P. SEDGWICK, B.S., M.D., Professor of Pediatrics
- WALTER D. SHELDON, B.S., M.D., Associate Professor of Medicine (Mayo Foundation)
- WALTER E. SISTRUNK, Phm.G., M.D., Associate Professor of Surgery (Mayo Foundation)
- JOHN H. STOKES, B.A., M.D., Assistant Professor of Dermatology (Mayo Foundation)
- ARTHUR C. STRACHAUER, M.D., Assistant Professor of Surgery
- ROOD TAYLOR, M.D., D.Sc. in Pediatrics, Assistant Professor of Pediatrics (Mayo Foundation)
- \*FRANK C. TODD, M.D., Professor of Ophthalmology and Oto-Laryngology
- HENRY L. ULRICH, M.D., Associate Professor of Medicine
- \*S. MARX WHITE, M.D., Professor of Medicine
- \*LOUIS B. WILSON, M.D., Professor of Pathology (Mayo Foundation)
- ROY A. BARLOW, M.D., Instructor in Rhinology and Oto-Laryngology (Mayo Foundation)
- JOHN L. CRENSHAW, M.D., Instructor in Surgery (Mayo Foundation)
- DORR F. HALLENBECK, M.D., Instructor in Medicine (Mayo Foundation)
- WILLIS S. LEMON, M.B., Instructor in Medicine (Mayo Foundation)
- HENRY W. MEYERDING, B.S., M.D., M.S. in Orthopedic Surgery, Instructor in Orthopedic Surgery (Mayo Foundation)

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\* Absent on leave.

JOHN DE J. PEMBERTON, B.A., M.D., M.S. in Surgery, Instructor in Surgery  
(Mayo Foundation)

LEDA J. STACY, M.D., Instructor in Medicine (Mayo Foundation)

HENRY W. WOLTMANN, B.S., M.D., D.Sc. in Neurology, Instructor in  
Medicine (Mayo Foundation)

## GENERAL INFORMATION

The graduate work in medicine here outlined is not intended for those seeking brief practitioners' or review courses. Opportunities of this kind are to be found in the bulletin of the Medical School.

### HISTORY

In the fall of 1914, the University of Minnesota began graduate work in various fields of medicine and surgery in addition to that already offered for some time in the laboratory branches. The conditions laid down for this work as regards admission, residence, thesis, and examinations were those already applied by the Graduate School in approving all candidates for graduate degrees.

Since June, 1915, the Board of Regents have had at their command for this work, in addition to the facilities of the Medical School, the income and resources of the Mayo Foundation\* and of the staff, clinics, laboratories, library, and records at Rochester, Minnesota.

### PURPOSE

In an age of specialization and of the development of graduate work in all fields and phases of the sciences, letters, and arts, such an educational experiment needs no elaborate justification. In a subject like medicine, intimately connected with established fields of research such as biology, chemistry, anatomy, physiology, pathology, and bacteriology, the need for scientific research and for the training of scientific specialists, investigators, and teachers is as great as in any subject, and of as vital importance.

The possibilities of such work hitherto have suffered less from neglect than they have from the lack of organization, standardization, and certification by the educational institutions which have found it possible and advisable to put such applied subjects as agriculture, education, engineering, and commerce upon a scientific basis, and have freely recognized the accomplishments of trained students by the granting of higher earned degrees in these fields. In medicine, in the United States, the specialist in practice and the trained investigator have come to us either as a development from extended practice narrowing to a particular field; by periods,

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\* Research in pathology, clinical medicine, and surgery has been carried on at Rochester for several years. In 1912, definite three-year courses in these subjects for graduates in medicine were instituted. In order to perfect the organization and place the work on a permanent basis, February 9, 1915, a corporation, the Mayo Foundation for Medical Education and Research, was founded by Drs. William J. and Charles H. Mayo. On June 9, 1915, the University of Minnesota and the Mayo Foundation for Medical Education and Research entered into an agreement, by the terms of which the funds and income of the Mayo Foundation for Medical Education and Research are devoted, under the direction of the Regents of the University of Minnesota, to the promotion of graduate work in medicine and to research in this field. On September 13, 1917, the funds and income of the Mayo Foundation were transferred entirely to the Regents of the University.

long or short, of foreign study; by what has been called postgraduate or polyclinic medical courses; or by the simple and convenient method of self-proclamation. Taken as a whole, the results of such processes can hardly be called satisfactory, nor do they supply any sure protection to the public or any open avenue for the specialist to the public's confidence. And medical education, if it is to advance, must at least be able to supplement a faculty of skilled practitioners with men trained to carry forward the frontiers of medical science.

The objects of this graduate work in medicine are accordingly the training for medical practice of fully equipped and properly certified specialists and of investigators and teachers of medicine.

#### STANDARDS AND REQUIREMENTS

In entering upon this work the best methods for securing results and safeguarding scientific standards have, it would seem, already been indicated by the graduate work developed here and elsewhere in other pure and applied sciences. The proper development of any experiment in graduate work in medicine would then depend upon real standards of admission, qualified teachers supplied with adequate laboratory, clinical, and library equipment, and rigid tests in course and examinations in residence, together with evidence of the power of productive research on the part of the students as evidenced in a thesis.

In doing this work the University of Minnesota is not seeking to multiply the opportunities for securing simply technical training through practitioners' courses. The graduate work is definitely intended to make the three-years' work a training for the well-prepared and serious-minded student who wants to be a scientist, working in some special field of medicine or surgery. Entrance upon the work and continuance in it, as well as the holding of scholarships or fellowships in the Medical School or on the Mayo Foundation, will be strictly conditioned upon evidences of power and growth along scientific lines. The value of technical or mechanical skill as a practitioner or operator has its place, but will be subordinated to and measured by the power and product of the brain that guides the hand. From the standpoint of both the University and the prospective student it is highly important that this distinction in purpose be kept clearly in mind.

In the selection of graduate medical students, and in making appointments to fellowships for medical graduate work, preference will be given, other things being equal, to students who have done more than the usual amount of undergraduate medical work in the fundamental medical sciences (i.e., anatomy, physiology, pathology, etc.) through which they should make their approach to the specialty which they wish to take as a major subject.

By the present arrangement of courses in arts, science, and medicine, a properly prepared student may enter the University, and in seven years secure the usual doctorate degree in arts, in science, or in medicine. The object of the new plan is to provide three years of additional work on

the basis of the degree of Doctor of Medicine, and leading to the special degrees of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) in Medicine, in Surgery, in Pathology, etc.

#### LABORATORY AND CLINICAL EQUIPMENT

The laboratory and clinical equipment for the prosecution of graduate work in medicine is located in Minneapolis, St. Paul, and Rochester.

The laboratory branches are well housed and in excellently equipped buildings on the campus at Minneapolis and in Rochester. Anatomy, chemistry, and pathology and bacteriology are in modern buildings especially designed for them. Physiology, physiological chemistry, and pharmacology are located in Millard Hall, a modern building of the best type. The laboratories for experimental medicine and surgery, and extensive animal quarters are also in this building.

The University owns and controls Elliot Memorial Hospital with its service building. This provides a clinic of 200 beds, and has the accumulated hospital records of nine years. The Outpatient Department of the Hospital is housed in Millard Hall and received 15,876 new patients and 56,186 patients' visits during the year ending July 31, 1917. The University museums of anatomy, pathology, and surgery contain a large number of specimens available for teaching and study.

The State Hospital for the Crippled and Deformed at Phalen Park, St. Paul, offers the University full participation in its clinical opportunities.

The City Hospital of Minneapolis and the City and County Hospital of St. Paul, representing in all some 1,400 beds, exhibit every phase of clinical service in their wards and amphitheaters.

In Rochester, St. Mary's Hospital and other local hospitals at the disposal of the Mayo Foundation for Medical Education and Research aggregate 950 beds. These with the Mayo Clinic building and annexes include a modern and extensive equipment in laboratories, museums, and examining and operating rooms with equipment for roentgenologic, cardiographic, cystoscopic, and photographic work. In the Mayo Clinic building there are thirty-nine experimental and research laboratories.

During 1917, 47,091 patients were examined clinically in Rochester. More than 225,000 clinical histories are on file. During 1917, 17,060 surgical operations were performed. Of all patients dying, 87.7 per cent were examined post mortem. The working museum contains more than 75,000 pathologic specimens. All case histories and specimens are classified and arranged so as to be readily available for scientific research.

Arrangements have been made whereby fellows or other graduate students in Medicine may divide their time, part of their work being taken on the Mayo Foundation at Rochester, and part in the Medical School in Minneapolis and St. Paul.



## LIBRARIES

Besides the University Library and the departmental libraries, there are at the disposal of the student the general medical libraries in Millard Hall and the Mayo Clinic Building, and the collections of the Hennepin County and Ramsey County Medical Societies. Current issues and complete files of most important medical periodicals are available either in Minneapolis or Rochester.

## REGISTRATION AND NUMBER OF STUDENTS

Students entering upon graduate work in medicine will register with the Dean of the Graduate School. Students who begin their residence work in Rochester may fulfill the preliminary requirements by registering there with the Director of the Mayo Foundation.

The number of graduate students who will be registered for work is limited to approximately sixty, most of whom will be on the list selected for fellowships on the Mayo Foundation or as teaching fellows in the Medical School. This limitation in numbers is determined by the clinical opportunities. It applies to those doing their major work in clinical medicine and surgery and not to those majoring in the laboratory departments.

## TUITION

The tuition fee for the graduate work in clinical medicine and surgery is twenty-five dollars per semester. For students in the fundamental laboratory branches, the tuition fee is fifteen dollars per semester. Extra fees may be charged to cover the cost of materials and supplies for exceptional laboratory experimentation. The fees for graduate work in the summer session are stated in the special summer session bulletin. Fellows, scholars, and members of the teaching or scientific staff are exempt from tuition and fees.

## FELLOWSHIPS AND SCHOLARSHIPS

Teaching fellowships in the Medical School are now established as follows: in surgery, two; in internal medicine, two; in obstetrics, two; in ophthalmology and otolaryngology, two; in mental and nervous diseases, two; and in pediatrics, two. They carry a stipend of \$500 the first year, \$750 the second, and \$1,000 the third. These teaching fellows are required to devote their entire time (excepting an annual vacation of three weeks) to graduate work, including a small amount of teaching.

Similar teaching fellowships have been established in the fundamental laboratory department of the Medical School as follows: in anatomy (including histology and embryology), three; in physiology and physiological chemistry, two; in pathology and bacteriology, one. These fellowships carry a stipend of \$500 the first year, \$600 the second, and \$700 the third year. They require a small amount of teaching, the remainder of the time being devoted to graduate work leading to advanced degrees.

Special fellowships in Ophthalmology and Oto-Laryngology have been established by Dr. Frank C. Todd, of Minneapolis, and Dr. Frank E. Burch, of St. Paul. These fellowships carry the same stipends as the teaching fellowships. Students holding these fellowships spend half their time in the private clinics of Doctors Todd and Burch, where they act as clinical assistants and graduate students. The other half of their time is spent in correlated graduate work in the fundamental laboratories at the Medical School.

In addition, there are at Minneapolis five scholarships, without stipend, carrying free tuition with opportunity for graduate study in any of the clinical departments.

The attention of prospective medical graduate students is also called to the Shevlin Fellowship in Medicine yielding \$500 and tuition. Applications should be in the hands of the Dean of the Graduate School before March 1.

The Mayo Foundation carries the following fellowships: in clinical and experimental surgery, twelve; in clinical and experimental medicine, three; in pathology, two; in bacteriology, two; in orthopedic surgery, urology and proctology, ophthalmology and otology, rhinology and laryngology, and roentgenology, one each. In addition there are available, without stipend, opportunities for residence work in Rochester for twelve students majoring in clinical and experimental surgery, three in clinical and experimental medicine, two in pathology, and one in bacteriology. The fellowships pay \$600 the first year, \$750 the second, and \$1,000 the third year. They require full time, with an annual vacation of two weeks.

Owing to the exigencies of the present military situation there are opportunities in some clinical and laboratory sections in the Mayo Foundation for students who are not fully qualified for fellowships. The work is essentially that of a fellow, and the student receives the same stipend, but without credit toward a degree.

The variation in stipend between the Foundation and Medical School is based upon the length of period per year in residence and differing opportunities to reduce the cost of living.

Nominations for fellowships upon the Mayo Foundation are made each quarter, beginning with August 1, for residence to begin six months later. In the Medical School appointments are made May 1 for residence to begin August 1.

All appointments are made for one year and renewable for a period of three years upon the basis of satisfactory progress in the work pursued. Requests for blanks for application for fellowships and scholarships should be addressed to the Dean of the Graduate School, University of Minnesota, Minneapolis, Minnesota, or to the Director of the Mayo Foundation, Rochester, Minn.

## ASSISTANTSHIPS

A few qualified research assistants (not candidates for a degree) may be accepted at Rochester in the laboratory branches for short periods. The number is necessarily limited in order not to interfere with the work of the resident fellows, scholars, and students. Correspondence concerning this work should be directed to the Director of the Mayo Foundation, Rochester, Minnesota.

Several of the departments in the Medical School (including anatomy, physiology, and pathology) have paid assistantships which may furnish means of self-support while the holder is pursuing graduate work. For further information, address the Dean of the Medical School.

## SUMMARY OF REQUIREMENTS

The various steps involved in the requirements for the degree of Doctor of Philosophy (Ph.D.) in any one of the clinical or laboratory departments are briefly summarized in the following. The requirements for the Master's degree (M.A. or M.S.) are also indicated. Further information concerning graduate work in general may be found in the general Graduate School Bulletin.

## REQUIREMENTS FOR ADVANCED DEGREES IN MEDICINE

1. *Admission*.—All graduate students are admitted by the Dean of the Graduate School. Entrance upon work for the advanced degrees of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) in the clinical departments of medicine is limited to those who have: (a) the Bachelor's degree in arts or science, or its equivalent;\* (b) the degree of Doctor of Medicine from acceptable institutions (i.e., those in Class "A" of the American Medical Association); and (c) one year's experience as an interne in an approved hospital or as an assistant in a laboratory in an acceptable medical school. In the fundamental laboratory sciences (anatomy, physiology, bacteriology, pathology, and pharmacology) properly prepared students may be admitted without (b) and (c) as candidates for the Master's degree (M.A. or M.S.) or the Doctor's degree (Ph.D.).

Upon entrance to the Graduate School, the candidate, with the approval of the Dean, will select his adviser in the field of his major work. With the approval of his adviser and the Dean, he will outline a study program for the year.

The study program for the second and third years is subject also to the approval of the Medical Group Committee.

2. *Residence*.—For the Doctor's degree (Ph.D.) at least three full years of successful graduate study are required, including certain special requirements noted below. For the Master's degree (M.S.) in clinical subjects, two or three years are required. For the Master's degree in the laboratory sciences only one year of residence is required.

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\* Students who have completed at least two years of premedical collegiate work, making an equivalent of the seven-years combined Arts-Medicine course at the University of Minnesota, are eligible for admission as graduate students.

3. *Language requirements.*—A reading knowledge of French and German must be certified by the professors in charge of these languages at least one year before the Doctor's degree is conferred, and before admission to the preliminary examination. For the Master's degree in the laboratory sciences, a reading knowledge of only one foreign language is required, which must be certified before the end of the first semester. For the Master's degree (M.S.) in the clinical branches, the language certificate is optional.

4. *Minor.*—With the approval of his adviser and the Dean of the Graduate School, each student upon entrance selects a minor, which must be logically related to his major subject, and (for the Doctor's degree) must be completed before the end of the second year. The minor is preferably a laboratory subject in some other department, and should amount to not less than one sixth of the total work for the degree. At least one fourth of the work offered for the degree in a clinical subject should consist of graduate work in the fundamental laboratory branches, which will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated in the first part of the course so far as possible. The final examination in the minor for the Doctor's degree is included in the preliminary examination, as noted below. For the Master's degree no special examination is required in the minor, aside from the usual course examinations.

5. *Major.*—The major is that department in which the student desires to specialize. Together with the thesis, it should occupy at least two thirds of the total work for the degree. At least one year before attaining the Doctor's degree, the following procedure is required in order that the candidate may become eligible for the preliminary examination. In addition to the completion of the minor work and of the language requirement, he must have the written approval of the department committee (which includes the Graduate Faculty members) of the major subject. The statement of the department committee should include the subject of the special problem for the thesis, and should certify as to the ability of the candidate to meet all requirements for the degree sought.

6. *Admission to candidacy.*—For the Master's degree, students who have met the language requirement and whose thesis subject has been properly approved are admitted to candidacy at the beginning of the second semester by vote of the Executive Committee of the Graduate School. For the Doctor's degree, the student is required to pass a preliminary examination, as noted below, before admission to candidacy.

7. *Preliminary examination.*—At least one calendar year before the Doctor's degree is conferred, a preliminary examination of the student shall be given by a committee consisting of the student's adviser as chairman, a representative of the Medical Graduate Committee (other than the adviser) and all members of the Graduate Faculty in his major and minor departments. Certificates of proficiency in French and German, completion of the minor work and the recommendation of the major department shall be required before admission to this examination. The



examination is in addition to the usual course examinations. It shall cover the graduate work previously taken by the student, and may include any work fundamental thereto. The examination may be either written or oral, or both, as determined by the examining committee. Only after the successful completion of this examination may the student be enrolled as a candidate for the Doctor's degree. Students failing to pass this preliminary examination shall not be reexamined until at least one semester has passed.

8. *Thesis*.—Each candidate for an advanced degree (Master's or Doctor's) must submit a thesis. For the Master's degree, the subject of the thesis should be filed with the Dean of the Graduate School by November 15. The subject must be approved by the adviser and by the Medical Graduate Committee. The topic should be within the field of the major, and the thesis should represent approximately half of the year's work of the student. The thesis must be written in acceptable English. It must show ability to work independently, give evidence of power of independent thought both in perceiving problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authorities are expected.

The Master's thesis must be typewritten in triplicate, one copy on a special form of linen stock, the other two as carbon copies. Samples of the paper required should be examined in the Dean's office. The three copies of the thesis must be filed in the Dean's office not later than May first. The thesis will be examined by a committee appointed by the Dean, on recommendation of the Medical Graduate Committee. Unanimous approval by the thesis committee is necessary for the acceptance of the thesis. If the thesis is accepted, the candidate must deposit with the Registrar, at least one week before Commencement, the sum of one dollar for binding one copy of the thesis, which will be cataloged and deposited in the University Library.

For the Doctor's degree, a more elaborate thesis is required. The subject is to be stated in the written department recommendation, which precedes the preliminary examination at the end of the second year. The accumulation of material for the thesis should be started much earlier. The thesis must give evidence of originality and power of independent investigation. It must embody results of research forming a real contribution to knowledge and must exhibit a mastery of the literature of the subject and a familiarity with the sources of knowledge. The matter must be presented with a fair degree of literary skill.

The thesis must be typewritten in triplicate, to facilitate reading by the thesis committee. No special size or form is required for the Doctor's thesis, since it is to be printed subsequently. The three copies must be filed in the Dean's office not later than May 1. The Dean will appoint a thesis committee with the student's adviser as chairman. Unanimous approval by this committee will be necessary for the acceptance of the thesis. If the thesis is accepted, the candidate must deposit with the Registrar, not later than one week before Commencement, a sufficient



bond or such sum of money as will be required to print 100 copies of the thesis for the use of the University and as many additional copies as the candidate may require for himself. If the thesis is to be published elsewhere, reprints will be acceptable, if bound with covers in the special form required by the University.

9. *Final written examination.*—In addition to the usual course examinations in all subjects where such are given, the candidate for the Master's degree must pass a final written examination in the field of the major. (No *special* final examination is required in the minor.) The final written examination will be held not later than four weeks before Commencement. It is given by the members of the Graduate Faculty in the major department, the adviser acting as chairman. This examination shall cover all the work done in the major, and may include any work fundamental thereto.

For the Doctor's degree, a final written examination in the major subject is similarly given, after the thesis is presented and at least four weeks before Commencement.

10. *Final oral examination.*—If all other requirements for the degree have been met, including the final written examination and the acceptance of the thesis, the final oral examination will be held, not less than two weeks before Commencement.

For the Master's degree, the adviser will act as chairman of the examining committee, which will include all the instructors with whom the student has taken work, the thesis committee, and *ex-officio*, the head or chairman of the department in which the major work is done. Any member of the Graduate Faculty may attend as a visitor, and written notice shall be sent by the chairman of the committee to all members of the Graduate Faculty in the major and minor departments. The final oral examination will cover all the work offered for the degree, and may include other work fundamental thereto. At the close of the examination, the committee will vote upon the candidate, taking into account all of his work. A majority vote is required for approval.

For the Doctor's degree, the committee conducting the final oral examination will consist of the adviser as chairman, of a majority of the members of the Graduate Faculty in the major department, and of at least three other members of the Graduate Faculty appointed by the Dean. At least one member of this committee shall be from a group other than the one in which the major department is included. This examination is to cover the field of knowledge represented by the major work, and shall not exceed three hours. The date of the final oral examination for the doctorate shall be publicly announced, and the examination shall be open to any member of the Graduate Faculty. Upon completion of the examination, a formal vote of the committee shall be taken and an affirmative vote of at least two thirds of the members shall be necessary for recommendation of the candidate for the degree.

11. *Recommendation by the Faculty.*—The Dean will report to the Graduate Faculty the names of those who have completed the requirements for the Master's and Doctor's degrees, and those duly approved

will be recommended by the Faculty to the Board of Regents of the University. Unless excused by the Dean of the Graduate School and the President of the University, all candidates are required to be present at Commencement when the degrees are conferred.

CLINICAL AND CLASS WORK FOR VISITING OR RESIDENT  
PRACTITIONERS

In order that there may be no misunderstanding, it should be stated that the graduate work for a limited number described above in no way changes or modifies the opportunities for observation hitherto extended visiting surgeons by the Mayo Clinic in Rochester, or the arrangements offered in Minneapolis by the Medical School for practitioners who wish to attend such undergraduate medical classes as may be of profit to them without interfering with the regular work of the staff and students of the Medical School. Inquiries concerning these opportunities should be addressed to the Dean of the Medical School.

## TABULAR SUMMARY OF REQUIREMENTS

## FOR THE MASTER'S DEGREE

WORK	UNDER THE DIRECTION OF	DATE
Program, Major and Minor	Adviser and Dean of the Graduate School.	On entrance.
Approval of thesis subject	Adviser and Group Committee...	November 15.
Language requirement...	Adviser and language department.	Before close of first semester.
Approval of candidacy...	Executive Committee.....	Beginning of second semester.
Filing of thesis.....	Dean of the Graduate School...	May 1.
Examination of thesis...	Thesis committee.....	Before admission to final oral examination.
Final written examination in major.....	Major department members of the Graduate Faculty.	Not later than four weeks before Commencement and before final oral.
Final oral examination on all work.....	Thesis committee; all instructors; head of major department. (Course examinations as required at the usual time.)	Not later than two weeks before Commencement.
Fee for binding thesis...	Registrar .....	One week before Commencement.

(For the Master's degree in clinical subjects, the dates refer to the last year.)

## TABULAR SUMMARY OF REQUIREMENTS

## FOR THE DOCTOR'S DEGREE

WORK	UNDER THE DIRECTION OF	DATE
<b>FIRST YEAR</b>		
Major .....	Adviser and Dean of Graduate	
Minor .....	School.	
<b>SECOND YEAR</b>		
Tentative program of entire second and third year's work.	Adviser, Medical Graduate Committee and Dean of Graduate School.	Before beginning work of second year.
Major, including thesis	As for tentative program.	
Minor .....	Adviser and minor department..	} Before admission to preliminary examination.
Language .....	Adviser and language department	
Recommendation .....	By major department.....	
Preliminary examination	Special committee.....	One calendar year before degree is to be conferred.
<b>THIRD YEAR</b>		
Major, including thesis	Adviser, Medical Graduate Committee and Dean of Graduate School.	
Filing of thesis.....	Dean .....	May 1.
Examination of thesis..	Thesis committee.....	Before admission to final oral examination.
Final written examination in major.	Major department members of the Graduate Faculty.	Four weeks before Commencement and before final oral examination.
Final oral examination	Adviser, majority of members of major department and other members appointed by Dean of Graduate School.	Not later than two weeks before Commencement.
Bond for publication of thesis.	Registrar .....	Not later than one week before Commencement.

## DEPARTMENTAL STATEMENTS

The members of the Faculty at Rochester (Mayo Foundation) are indicated by an asterisk (\*) in the list at the head of each departmental statement. The courses given at Rochester are grouped separately, and the numbers given the special prefix "M." In general, the odd numbers indicate first semester courses; even numbers, second semester courses. A combination (e.g., 101-102) indicates courses continuing through the year. Courses repeated each semester are denoted by the suffix a or b (e.g., 101a,b). The courses numbered between 100 and 200 are less advanced in character and in some cases are open as electives to properly qualified undergraduates. The courses above 200 are primarily graduate in character, of the more advanced or research type.

The various divisions are grouped under the following departments:

1. Anatomy (including Histology and Embryology).
2. Medicine (including General Medicine and Mental and Nervous Diseases).
3. Obstetrics and Gynecology.
4. Ophthalmology and Oto-Laryngology.
5. Pathology, Bacteriology, and Public Health.
6. Pediatrics.
7. Pharmacology and Therapeutics.
8. Physiology and Physiologic Chemistry.
9. Roentgenology.
10. Surgery (including General Surgery, Experimental Surgery, Orthopedic, and Genito-Urinary Divisions).

### ANATOMY

Professors CLARENCE M. JACKSON, JOHN B. JOHNSTON, THOMAS G. LEE, RICHARD E. SCAMMON; Assistant Professor ANDREW T. RASMUSSEN.

The new Institute of Anatomy offers excellent facilities to students who wish to take advanced work or to pursue investigations in anatomy.

The prerequisite work for all students who desire a major or minor in the Department of Anatomy includes general zoology (animal biology), six credit hours, and advanced zoology or elementary courses in anatomy (including histology, embryology, and neurology), six hours. In addition, each student who desires a major in anatomy must have had the elementary courses in that branch of anatomy in which he desires to specialize—gross anatomy, histology, embryology, or neurology. Students majoring in clinical subjects who desire a minor in anatomy must have had the courses in anatomy usually required of medical students (including Courses 101, 102, and 103). A reading knowledge of German is required of students who desire a major in anatomy for the Master's degree, and a reading knowledge of both French and German is required of those who are candidates for the Doctor's degree.

## COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

101. HUMAN HISTOLOGY. A microscopic study of the various tissues and organs. Prerequisite: Animal Biology 1-2. Five credits. SCAMMON.
102. HUMAN EMBRYOLOGY. The development of the human body. Prerequisite: Anatomy 101, or equivalent. Three credits. LEE, SCAMMON.
103. HUMAN NEUROLOGY. A study of the gross and microscopic structure of the central nervous system and sense organs of man. Prerequisites: Anatomy 101 and 102, or Animal Biology 7-8 or 19-20. JOHNSTON, RASMUSSEN.
- 107-108. COMPARATIVE NEUROLOGY OF VERTEBRATES. Prerequisites: Anatomy 103 or Animal Biology 19-20. JOHNSTON.
- 111a,b. ANATOMICAL TECHNIQUE. Lectures and laboratory work upon the principles and practice of microtechnique. Prerequisites: Anatomy 101, or Animal Biology 7-8. Three credits. LEE.
114. TOPOGRAPHIC ANATOMY. Based upon a study of cross-sections of the human body. Lectures and laboratory work. Prerequisites: Anatomy 3-4. Three credits. JACKSON.
115. FETAL ANATOMY. Dissection of the fetus and new-born. Prerequisites: Anatomy 3-4 and 102, or Animal Biology 131-132. Three credits. SCAMMON.
117. IMPLANTATION AND PLACENTATION. A study of the implantation of the ovum, the formation of the placenta and the earliest stages of development in man and mammals. Prerequisites: Anatomy 102 or equivalent. Three credits (or less). LEE.
- 123-124. ADVANCED ANATOMY. Individual topics for advanced work in gross anatomy, histology, embryology, or neurology will be assigned to students who have completed the elementary courses in the corresponding subjects. Special courses are arranged for clinical graduate students. JACKSON, JOHNSTON, LEE, SCAMMON, RASMUSSEN.

## PRIMARILY FOR GRADUATE STUDENTS

- 201-202. RESEARCH IN ANATOMY. Qualified students may undertake the investigation of problems in anatomy, including histology, embryology, and neurology. Special facilities are offered to graduate students in the clinical departments for work upon problems in applied anatomy. JACKSON, JOHNSTON, LEE, SCAMMON, RASMUSSEN.
- 203-204. ANATOMICAL SEMINAR. Reviews of the current literature and discussion of research work being carried on in the department. Reading knowledge of French and German required. JACKSON and staff.



## MEDICINE

(Including General Medicine, Dermatology, and Nervous and Mental Diseases)

Professors CHRISTOPHER GRAHAM,\* ARTHUR S. HAMILTON, THOMAS B. HARTZELL, HENRY S. PLUMMER,\* LEONARD G. ROWNTREE, S. MARX WHITE; Associate Professors HERBERT Z. GIFFIN,\* ARCHIBALD H. LOGAN,\* WALTER D. SHELDON,\* HENRY L. ULRICH; Assistant Professors WALTER M. BOOTHBY,\* GEORGE B. EUSTERMAN,\* ROBERT D. MUSSEY,\* JOHN H. STOKES;\* Instructors DORR F. HALLENBECK, WILLIS S. LEMON, LEDA J. STACY, HENRY W. WOLTMANN.

The graduate work in the Department of Medicine is designed to prepare students for practice of the specialty of internal medicine, research in the problems of general medicine, and for the specialty of nervous and mental diseases, as the case may be. Prospective students who have had no special work in addition to that of the undergraduate course in physiology, physiologic chemistry, therapeutics, experimental medicine or pathology are advised to devote a year or more to these subjects before entering the regular three years' graduate course. In addition, it is recommended that a minor be carried throughout the course in one or more of the following departments: Physiology, pharmacology, pathology, bacteriology and public health, and pediatrics. For students specializing in nervous and mental diseases, minors in anatomy and psychology are especially valuable, and for those desiring it, a minor could be arranged in the Department of Ophthalmology and Oto-Laryngology, giving a special opportunity to study lesions of the eye occurring in systemic disorders. In the Medical School, during at least the third year of the three-year fellowship, the fellow acts as an officer of the clinic with definite responsibility in the care of patients in the University Hospital.

## A. COURSES OFFERED AT MINNEAPOLIS

- 121-122. CLINICAL MEDICINE. A study of physical diagnosis and the methods of investigation and recording clinical data. The laboratory of experimental medicine is open for the study of special problems arising in the investigation of cases. Emphasis placed on methods of treatment. ROWNTREE, WHITE.
- 123-124. DISEASES OF CARDIOVASCULAR APPARATUS. A special study of diseases of the heart and blood-vessels, including the technique and application of the polygraph, electrocardiograph, and the interpretation of outlines of the heart and great vessels obtained by means of the radiogram and orthodiagram. WHITE.
125. PATHOLOGY OF THE NERVOUS SYSTEM. The preparation of gross and microscopic material from diseased nerve tissues; the relations existing between pathologic lesions, signs, and symptoms; the chief neuron systems and principles underlying their degeneration. HAMILTON.

126. ADVANCED NEUROPATHOLOGY. A course consisting of several hours of demonstrations in papillo-edema and work of similar character, with study of the microscopic sections, etc. Opportunity for individual work for any desired period. HAMILTON.
- 127-128. CLINICAL NEUROLOGY. Advanced diagnosis of nervous diseases; practical experience in diagnostic procedures employed in the study of diseases of the nervous system. The diagnosis and treatment of syphilis of the central nervous system. HAMILTON.
- 201-202. NEUROLOGIC RESEARCH. HAMILTON.
- 203-204. RESEARCH IN MOUTH INFECTIONS. A study of dental and parodontal infections as related to systemic disease. Experimental study to determine the lesion produced in animals by bacteria from these sources. HARTZELL.
- 205-206. MEDICAL CHEMISTRY. Chemical and metabolic studies in nephritis, diabetes, acidosis, diseases of the liver, etc., together with research work along biochemical lines. ROWNTREE.
- 207-208. PROBLEMS IN MEDICINE. Specific problems in diagnosis and treatment, including problems in immunology viewed from the clinical standpoint. ULRICH.
- 209-210. RESEARCH IN MEDICINE. ROWNTREE, WHITE.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

The work in diagnosis consists of history taking, physical diagnosis, the correlation of the various special examinations and the formation of an independent judgment concerning diagnosis, indications for medical and surgical treatment and recommendations, under the immediate direction of the chief of the section and his first assistant. A study of methods of investigation, the recording and tabulating of case records for special work and the study of special laboratory problems in connection with the sectional work is encouraged.

- M151-152. HEMATOLOGY, URINALYSIS, CLINICAL BACTERIOLOGY, AND PARASITOLOGY. SANFORD.
- M153-154. GASTROLOGICAL LABORATORY. GRAHAM, EUSTERMAN.
- M155-156. LABORATORY OF CLINICAL BACTERIOLOGY AND PARASITOLOGY. SANFORD.
- M157-158. LABORATORY OF HEMATOLOGY AND URINALYSIS. SANFORD.
- M159-160. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to diseases of the gastro-intestinal and accessory digestive tracts. GRAHAM, EUSTERMAN.

- MI61-162. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to diseases of the female genital system. GRAHAM, STACY.
- MI63-164. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to diseases of the ductless glands, and the esophagus. PLUMMER, WILLIUS.
- MI67-168. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to diseases of the blood and blood-forming organs. GIFFIN, HALLENBECK.
- MI69-170. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. LOGAN.
- MI71-172. GENERAL MEDICAL AND SURGICAL DIAGNOSIS, with special reference to diseases of the chest. LEMON.
- MI73-174. PRACTICAL WORK IN NEUROLOGY AND PSYCHIATRY. SHELDON, WOLTMANN.
- M251-252. ADVANCED WORK IN ELECTROCARDIOGRAPHIC LABORATORY. PLUMMER, WILLIUS.
- M253-254. PRACTICAL AND RESEARCH WORK IN DERMATOLOGY. STOKES.
- M255-256. METABOLISM LABORATORY. Respiratory exchange, acidosis, and allied problems. PLUMMER, BOOTHBY.

For courses in pathology, physiologic chemistry, urologic diagnosis, diagnosis of diseases of the eye, ear, nose, and throat, orthopedic diagnosis, and roentgen plate reading, see announcements by the corresponding departments.

## OBSTETRICS AND GYNECOLOGY

Professor JENNINGS C. LITZENBERG.

Of the courses in other departments open to graduate medical students, the following are especially recommended for those desiring to specialize in obstetrics and gynecology:

Advanced Anatomy; gross and histological, of the female generative organs (Anatomy 123-124).

Fetal Anatomy: dissection of fetus and new-born (Anatomy 115).

Implantation and Placentation (Anatomy 117).

Advanced Physiologic Chemistry (Physiology 153-154).

Gynecological Pathology (Pathology 118).

Experimental Pharmacology (Pharmacology 104, 109a,b).

Other courses in fundamental or clinical subjects may be elected.

The following graduate courses are offered in the Department of Obstetrics and Gynecology (at Minneapolis):

- 107-108. ADVANCED PATHOLOGY OF THE FEMALE GENERATIVE ORGANS. Required of first- or second-year fellows in obstetrics and gynecology. Prerequisite: Pathology 108, or equivalent.
- 111-112. CLINICAL OBSTETRICS AND GYNECOLOGY. A course in diagnosis and treatment, with special study of selected cases. Clinic in the Outpatient Department of the University Hospital, M.W.F., throughout the year. Required of first year fellows, and may be elected by second year fellows.
- 113-114. CLINICAL OBSTETRICS AND GYNECOLOGY. Similar to Course 111-112, but on T.Th.S. Required of second year fellows, and may be elected by first year fellows.
- 115-116. ADVANCED OBSTETRICS AND GYNECOLOGY. Includes service in the University Hospital, affording ample opportunity for experience in diagnosis, care and treatment (operative and non-operative) of patients. Special facilities offered for study of problems and cases of unusual interest. Required of first year fellows. LITZENBERG.
- 117-118. Similar to Course 115-116, but more advanced, both in clinical and research aspects of the subjects, so as to be adapted to the increased training and experience. Required of second year fellows. LITZENBERG.
- 119-120. Similar to Courses 115-116 and 117-118, but more advanced. Required of third year fellows. LITZENBERG.
- 201-202. SEMINAR. A conference of the staff, including the fellows and graduate students. Presentation and discussion of original work and reports upon the current literature in obstetrics and gynecology. Reading knowledge of French and German is necessary. LITZENBERG.
- 203-204. RESEARCH. Clinical and laboratory research upon problems in obstetrics and gynecology. Required of third year fellows, who must complete a satisfactory thesis during the year. Elective for second year fellows or other properly qualified graduate students. LITZENBERG.

#### OPHTHALMOLOGY AND OTO-LARYNGOLOGY .

Professor FRANK C. TODD; Associate Professors CARL FISHER,\* WILLIAM R. MURRAY; Assistant Professors WILLIAM L. BENEDICT,\* FRANK E. BURCH, HAROLD I. LILLIE,\* GORDON B. NEW,\* HORACE NEWHART; Instructor ROY A. BARLOW.

The graduate courses in these subjects are designed to prepare selected men for advanced work in the various lines, to prepare them for practice in these specialties, and to develop research and productive work in these subjects.

Of elective courses in other departments, the following are highly desirable:

Physics of Light (Physics 52) and Acoustics (Physics 31).

Advanced Optics (Physics 181-182).

Advanced Anatomy of the Head and Neck (Anatomy 123).

Topographic Anatomy of the Head and Neck (Anatomy 114).

Advanced Histology and Embryology of the Eye, Ear, Nose, and Throat (Anatomy 124).

Advanced Physiology of Vision and Hearing (Physiology 139-140, 210).

Physiologic Optics Seminar (Physiology 208).

Special Pathology of the Eye, Ear, Nose, and Throat (Pathology 208).

Immunity (Pathology 115).

Advanced Neuropathology (Medicine 126).

The following courses are offered within the Department:

#### A. COURSES OFFERED AT MINNEAPOLIS

131. ADVANCED OPERATIVE SURGERY OF THE EYE. Demonstrations upon the cadaver and live and dead animal eyes, with the usual operative procedures of practical value. Each graduate student will perform all the usual operations upon the cadaver and animals. Two and one-half hours a week. MURRAY, NEWHART.
132. ADVANCED OPERATIVE SURGERY OF THE NOSE AND THROAT. A course consisting of demonstrations upon the cadaver and the usual operative procedures of practical value. Each student will be given an opportunity to do work in the laboratory, performing all usual and practical operations. Two hours a week. MURRAY, NEWHART.
133. ADVANCED OPERATIVE SURGERY OF THE TEMPORAL BONE. A course of eight to twelve hours consisting of demonstrations and exercises on the cadaver at the Institute of Anatomy. Limited to four students. MURRAY, NEWHART.
134. OPERATIVE SURGERY ON THE LABYRINTH. A course consisting of lectures and practical demonstrations of diagnostic methods. Eight hours; Millard Hall. MURRAY, NEWHART.
- 135-136. ADVANCED COURSE IN REFRACTION WORK. A course consisting of eight lectures and illustrated demonstrations upon the errors of refraction and motor anomalies, supplemental and practical work in outpatient clinic on the refraction work (600 hours). MURRAY.
138. ADVANCED OPHTHALMOSCOPY. Training in the use of the ophthalmoscope by (a) direct method, and (b) indirect method. Examination in detail of the normal fundus oculi. Diagnosis of abnormalities (a) in the media, (b) in the fundus oculi. MURRAY.
- 139-140. ADVANCED OPHTHALMOLOGY. Three years' service in the wards and Outpatient Department of the University Hospital with clinic and laboratory research. Those taking this course will act as as-



sistants in outpatient clinics in operative and other clinical work. MURRAY and Assistants.

141-142. ADVANCED OTO-LARYNGOLOGY. Three years' service in the wards of the University Hospital and Outpatient Department with clinic and laboratory research. Those taking this course will act as assistants in outpatient clinics, in operative and other clinical work. MURRAY and Assistants.

143-144. CLINICAL OPHTHALMOLOGY AND OTO-LARYNGOLOGY. Special half-time assistantship and service in the private clinic of Professor Todd. A systematic course of assigned readings and study, with final examination, is included. For credit beyond one year, work in investigation must be included. TODD.

145-146. CLINICAL OPHTHALMOLOGY AND OTO-LARYNGOLOGY. Special half-time assistantship and service in the private clinic of Assistant Professor Burch. A systematic course of assigned reading and study, with final examination, is included. For credit beyond one year, work in investigation must be included. BURCH.

201-202. SEMINAR IN OPHTHALMOLOGY AND OTO-LARYNGOLOGY. Given by members of the staff and open to fellows, scholars, and other properly qualified graduate students. One and one-half hours a week throughout the year. MURRAY, NEWHART.

203-204. RESEARCH. Each graduate student will be required to pursue some line of original research in ophthalmology or oto-laryngology. MURRAY, NEWHART.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

MI01-102. REFRACTION. Theory, diagnosis, and treatment of refractive and muscular errors of the eye. Practical work on patients under supervision of the instructor. BENEDICT.

MI03-104. CLINICAL OPHTHALMOLOGY. Theory and practice of diseases of the eye, including instruction in operative ophthalmology, ophthalmoscopy, and ophthalmology in general diagnosis. BENEDICT.

MI05-106. CLINICAL OTOTOLOGY. Theory and practice with differential diagnosis of diseases of the ear, including instruction in operative otology, and the relations of diseases of the ear to nose and throat and to general diagnosis. LILLIE, BARLOW.

MI07-108. CLINICAL RHINOLOGY, LARYNGOLOGY, AND STOMATOLOGY. (a) Diagnosis and treatment of diseases of the nose, accessory sinuses, pharynx and larynx, including the diagnosis of surgical conditions of the face, jaws, mouth, and neck; (b) relation of nose, throat, and mouth to general diseases. LILLIE, NEW, BARLOW.

M109-110. EQUILIBRATION TESTS (BARANY). Clinical course for localizing brain lesions. Differential diagnosis. Lectures and clinical demonstrations. LILLIE, BARLOW.

NOTE: For courses in pathology of the eye, ear, nose, and throat, see announcement of the Department of Pathology.

## PATHOLOGY, BACTERIOLOGY, AND PUBLIC HEALTH

Professors HAROLD E. ROBERTSON, EDWARD C. ROSENOW,\* LOUIS B. WILSON;\* Associate Professors ELEXIOUS T. BELL, WINFORD P. LARSON, WILLIAM C. MACCARTY,\* ARTHUR H. SANFORD;\* Assistant Professor WAYNE W. BISSELL.\*

Graduate students who desire to take their major or minor work in pathology or bacteriology must present credits in the following subjects: physics, eight credits; general and organic chemistry, twelve credits; zoology, six credits; and a reading knowledge of German.

In addition, students who elect their major work in pathology must present credits for the equivalent of the first two years' work of the Medical School of this University.

Students who elect their major work in bacteriology must present credits in general bacteriology or its equivalent.

### A. COURSES OFFERED AT MINNEAPOLIS

101. GENERAL PATHOLOGY. General principles governing pathologic changes, including disturbances of the circulation, disturbances in metabolism, inflammation, regeneration and repair, and tumor formation. Assigned reading, didactic instruction with lantern demonstrations, and laboratory exercises upon gross and microscopic lesions. 96 hours. ROBERTSON, BELL.
102. SPECIAL PATHOLOGY. Applications of the principles of general pathology in infectious diseases, and the special pathology of lesions in the various organs and tissues. Lectures, special readings, study of museum specimens, fresh specimens, and microscopic preparations. 232 hours. ROBERTSON, BELL.
103. CLINICAL PATHOLOGY. The principles and methods involved in the examination of urine, blood, stomach contents, feces, sputum, exudates, and transudates; the relation of pathologic findings to the diagnosis of disease. 64 hours. WARWICK.
104. GENERAL BACTERIOLOGY. The preparation of culture media; the morphology of bacteria; methods of staining and identification; anaerobic bacteria; principles of sterilization and disinfection; examination of air, water, milk; relation of bacteriology to the industries. Prerequisites: general chemistry, and botany or zoology. 96 hours LARSON.

105. **SPECIAL BACTERIOLOGY.** The study of pathogenic bacteria, especially in relation to definite diseases; bacteriological methods in clinical diagnosis; principles of infection and immunity, with practical application of serum reactions. Prerequisite: general bacteriology. 72 hours. LARSON.
- 107-108. **CLINICAL-PATHOLOGICAL CONFERENCE.** Weekly conference over specimens obtained from post-mortems and operations in which the clinical and pathologic features are presented by those who have personally studied the cases and the specimens. BELL and Staff.
114. **ADVANCED BACTERIOLOGY.** An advanced course giving additional work in bacteriology and the opportunity of working out special problems. 48 hours. LARSON.
115. **IMMUNITY.** The study of natural and acquired immunity, including experiments to show the several types of protective substances and the principles and technic of serum diagnosis. 48 hours. LARSON.
117. **DIAGNOSIS OF TUMORS.** Rapid diagnosis and study of tumors and other pathologic conditions simulating tumor formation. Prerequisite: special pathology. 48 hours. BELL.
118. **GYNCOLOGICAL PATHOLOGY.** The special study of pathologic conditions found in the female genital tract. 48 hours. BELL, ADAIR.
121. **CLINICAL LABORATORY.** Practical diagnostic study in the Outpatient Department laboratory. 36 hours. WARWICK.
122. **MEDICAL ENTOMOLOGY.** A study of insects, and their allies, which are disease-bearers or parasites of man; life history, habits, and methods of control. Prerequisite: Animal Biology. MOORE.
- 201-202. **RESEARCH.** Graduate students of the necessary preliminary training may elect research in pathology or bacteriology, either as a major or minor subject. Hours to be arranged. ROBERTSON, BELL, LARSON.
- 205-206. **SEMINAR.** A weekly meeting of the members of the departmental staff at which the results of original investigation or reports of recent literature of special subjects are presented and discussed. Open to graduate students by special permission. ROBERTSON and Staff.
208. **SPECIAL PATHOLOGY OF EYE, EAR, NOSE, AND THROAT.** Laboratory investigations of special problems in the pathology of the organs mentioned. Only a limited number of medical graduate students, preferably those intending to specialize in this field, can be accepted. 48 hours. BERRISFORD.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

The graduate course in pathology is designed to prepare selected men for diagnostic and research work in pathology. The three years'

service should be prefaced by a year's intensive study of normal histology and embryology.

The graduate courses in bacteriology are open to students with previous training in bacteriology, holding only their Baccalaureate or Master's degrees in arts or science, as well as to graduates in medicine. They are designed to train well-equipped students for special work in bacteriologic diagnosis and research, and for the teaching of bacteriology.

The graduate courses in pathology and bacteriology are open also as minor courses to fellows in surgery, medicine, etc.

M151-152. *PATHOLOGIC DIAGNOSIS OF SURGICAL SPECIMENS AT OPERATION.*

Gross and microscopic study of fresh tissues. MACCARTY, BRODERS.

M153-154. *NECROPSY SERVICE.* Junior assistant (three months); senior assistant (three months); demonstrator of pathology in clinico-pathologic conference (three months); microscopic examination of fixed tissue removed at necropsies and operation. BISSELL, MANN.

M155-156. *CLINICAL AND BACTERIOLOGIC LABORATORY SERVICE.* Routine clinical and special research work in hematology, serology, bacteriology, and parasitology. ROSENOW, SANFORD.

M157-158. *CLINICAL BACTERIOLOGY AND PARASITOLOGY.* Making and examination of cultures; preparation and administration of autogenous vaccines; Wasserman tests; examination of stools and a study of internal parasites; special clinical laboratory methods, and opportunity for clinical or bacteriological research. SANFORD.

M225-226. *SPECIAL PATHOLOGY OF THE BONES AND JOINTS.* Gross and microscopic study of lesions of bones and joints; research work on assigned problem in pathologic anatomy. WILSON.

M257-258. *SPECIAL PATHOLOGY OF THE GENITO-URINARY ORGANS.* Animal experimentation; research on assigned problem. WILSON, MANN.

M259-260. *SPECIAL PATHOLOGY OF THE MOUTH, NOSE, AND THROAT.* Research work on assigned problem in the pathology of lesions of the mouth, nose, and throat. WILSON.

M261-262. *SPECIAL PATHOLOGY OF THE GASTRO-INTESTINAL TRACT.* Research work on assigned problem. WILSON.

M263-264. *SPECIAL PATHOLOGY OF THE EYE AND EAR.* Research work on assigned topic in the pathology of diseases of the eye and ear. WILSON.

M265-266. *SPECIAL PATHOLOGY OF THE NERVOUS SYSTEM.* Research work on assigned problem. WILSON.

M267-268. *RESEARCH ON ASSIGNED PROBLEMS IN GENERAL PATHOLOGY, MORPHOLOGICAL AND EXPERIMENTAL.* WILSON, MANN.

M269-270. RESEARCH STUDIES UPON THE ETIOLOGY OF NEOPLASMS. Work assigned. MACCARTY, BRODERS.

M271-272. RESEARCH IN CLINICO-PATHOLOGIC STANDARDIZATION. Work assigned. MACCARTY.

M273-274. GROSS AND MICRO-PHOTOGRAPHY FOR SCIENTIFIC AND RESEARCH PURPOSES. WILSON.

M275-276. EXPERIMENTAL BACTERIOLOGY. Research in the bacteriology of normal and diseased tissues, the blood, secretions, and exudates. Experimental inoculation of animals and immunological studies. Study of the therapeutic value of dead bacteria. ROSENOW.

NOTE: For course in applied pathology, see announcement of the Department of Surgery.

### PEDIATRICS

Professor JULIUS P. SEDGWICK; Assistant Professor ROOD TAYLOR.\*

The graduate work of the Department of Pediatrics is arranged with the intention (a) of preparing students to become competent pediatricists; (b) to put them in position to attack original pediatric problems; and (c) to make them competent teachers in the subject.

As a prerequisite a general understanding of physiologic and analytic chemistry and a working knowledge of French and German are essential.

Prospective students will find preparatory study in physiology and quantitative analysis of value.

Students will be encouraged to carry a minor in some of the fundamental branches.

### COURSES OFFERED AT MINNEAPOLIS

The following electives in other departments are desirable. (For further information see description of courses under departmental headings.)

Quantitative Analysis (Chemistry 139-140)

Organic Chemistry (Chemistry 175-176)

Physical Chemistry (Chemistry 121-122)

Mental Retardation (Psychology 105)

Physiologic Chemistry (Physiology 102, 153-4)

Physiology of Muscle, Nerve, Blood, Circulation, and Digestion (Physiology 103)

Physiology of the Nervous Systems and Special Senses: Respiration, Metabolism, Nutrition, and Excretion (Physiology 104)

Physical Chemistry of Cells (Physiology 111)

Electro-Physiology (Physiology 112)

Metabolism (Physiology 163)

Quantitative Methods (Physiology 164)

Human Neurology (Anatomy 103)



Fetal Anatomy (Anatomy 115)

General Roentgenologic Technic (Roentgenology M151-152)

Interpretations of Roentgenologic Findings (Roentgenology M255-256)

Hematology (Pathology 108)

Course in Immunity (Pathology 109-110)

The Physiological and Chemical Basis of Pharmacology (Pharmacology 113a,b.)

Diseases of Cardiovascular Apparatus (Medicine 123-124)

Medical Chemistry (Medicine 205-206)

Orthopedic Service (Surgery 119-120)

Orthopedic Diagnosis (Surgery M169-170)

Advanced Ophthalmoscopy (Ophthalmology 138)

The following courses are offered in the Department of Pediatrics by Professor Sedgwick and staff:

123. DISEASES OF THE NEW-BORN.

125. CONTAGIOUS DISEASES. The advanced study of contagious diseases, including the practice of intubation and tracheotomy, with training upon the cadaver.

126. THEORY AND PRACTICE OF INFANT FEEDING, including diseases of the gastro-intestinal tract.

131. INFANT FEEDING. Lymanhurst Hospital.

133X. PEDIATRIC CLINIC. Outpatient clinic; University Hospital.

133Y. PEDIATRIC CLINIC. Similar to 133X but largely upon school children.

142. PREPARATION OF INFANT FOODS. Practical work.

144. CONTAGIOUS DISEASES. Advanced study of contagious diseases.

200-201. ADVANCED STUDY IN DISEASES OF INFANTS AND CHILDREN.

202-203. RESEARCH IN DISEASES OF NEW-BORN. Students undertaking this work should have had the equivalent of Anatomy 115 and Pediatrics 123.

204-205. RESEARCH IN PHYSIOLOGY OF NEW-BORN. Prerequisites: General Pathology and Pediatrics 123. Prerequisite preparation in Physiology will depend upon the type of work undertaken.

206-207. RESEARCH IN DISEASES OF INFANTS AND GROWING CHILDREN. Required for major in Pediatrics. Prerequisite work will depend upon the type of work undertaken.

208-209. RESEARCH IN PHYSIOLOGY OF INFANTS AND GROWING CHILDREN. Required for major in Pediatrics. Prerequisite preparation will depend upon the type of work undertaken (Physiology 203-204 or 205-206).

- 210-211. RESEARCH IN ANATOMY OF INFANTS AND GROWING CHILDREN. Required for major in Pediatrics. Prerequisite preparation will depend upon the type of work undertaken.

## COURSES OFFERED AT ROCHESTER

- M151-152. CLINICAL WORK IN PEDIATRICS. Including the taking of histories, examination of patients, and outlining of treatment, including infant feeding under such supervision as is necessary. Opportunity is given to graduate students to develop their own initiative and resourcefulness. TAYLOR.
- M212-213. RESEARCH IN PEDIATRICS. Including the preparation of a thesis. Similar to Courses 206 to 211 given at Minneapolis. TAYLOR.

## PHARMACOLOGY AND THERAPEUTICS

Professor ARTHUR D. HIRSCHFELDER; Associate Professor EDGAR D. BROWN.

102. GENERAL PHARMACOLOGY. The principles underlying the structure, physicochemical properties, physiologic, therapeutic, and toxic actions of substances, natural or synthetic, used as medicines. At least one semester of physiology is prerequisite. 32 hours. HIRSCHFELDER, BROWN.
104. EXPERIMENTAL PHARMACOLOGY. Exercises illustrating the preparation and actions of medicine, their relation to chemical structure and their mode of administration. At least one semester of physiology is prerequisite. 48 hours. HIRSCHFELDER, BROWN.
- 105a,b. GENERAL PHARMACOLOGY AND THERAPEUTICS. A more detailed study of drugs important in clinical practice, covering the relations of chemical structure to physiologic and therapeutic action and modes of application in clinical medicine. 64 hours. HIRSCHFELDER, BROWN.
- 109a,b. ADVANCED EXPERIMENTAL PHARMACOLOGY. Special investigation and experimental study of one or more of the following topics: anesthetics; circulatory stimulants and depressants; drugs acting upon the kidneys; urinary antiseptics; poisons and antidotes; effects of common harmless drugs; internal secretions; action of drugs upon parasites, tumors, etc. 24 or 48 hours. HIRSCHFELDER, BROWN.
110. POISONS. Their detection, actions, and antidotes. 48 hours. BROWN.
111. PRESCRIPTION WRITING. The principles of prescription writing; study of flavoring, coloring, and incompatibilities of drugs. 16 hours. BROWN.
112. PRACTICAL MATERIA MEDICA. The study of crude drugs, pharmaceutical preparations, and the flavoring and compounding of prescriptions. 8 hours. BROWN.

113a,b. THE PHYSIOLOGICAL AND CHEMICAL BASIS OF PHARMACOLOGY. The relation of drug action to chemical structure; the mode of action and therapeutic application of various synthetic drugs; the study of chemotherapy. An adequate training in chemistry is prerequisite. 80 hours. HIRSCHFELDER.

201-202. SEMINAR IN PHYSIOLOGY AND PHARMACOLOGY. Reviews of recent literature bearing upon physiologic and pharmacologic subjects. Conducted by department directors, with the collaboration of the staffs and of qualified graduate or undergraduate students. 32 hours.

203-204. RESEARCH IN PHARMACOLOGY. HIRSCHFELDER, BROWN.

### PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

Professors ELIAS P. LYON, FREDERICK H. SCOTT; Associate Professors RICHARD O. BEARD, EDWARD C. KENDALL,\* JESSE F. McCLENDON; Assistant Professors FRANCIS B. KINGSBURY, CHAUNCEY J. V. PETTIBONE.

The Department of Physiology is well equipped for the various types of physiologic investigation. The library facilities are good.

For a minor in Physiology, general zoology, six credits, general chemistry, six credits, and college physics, are prerequisites. (In exceptional cases high-school physics may be accepted.) For a major, organic chemistry is an additional prerequisite, and physical chemistry is desirable.

For a minor or major in physiologic chemistry, general and organic chemistry, twelve credits, are prerequisite, and physical chemistry is desirable.

In addition, each student majoring in physiology or physiologic chemistry must have had the general courses, Physiology 102, 103, 104, or the equivalent.

Students majoring in clinical subjects, and who desire to minor in physiology or physiologic chemistry, must have had the courses in these branches usually required of medical students.

A reading knowledge of German is required of candidates for the Master's degree in this department, and a reading knowledge of both French and German, of candidates for the Doctor's degree.

#### A. COURSES OFFERED AT MINNEAPOLIS

102. PHYSIOLOGIC CHEMISTRY. The components of the animal body; foods, digestion, the excreta, and metabolism. Lectures and laboratory work. Prerequisite: Organic chemistry. Five credits. KINGSBURY, PETTIBONE.

103. PHYSIOLOGY OF MUSCLE, NERVE, BLOOD, CIRCULATION, AND DIGESTION. Lectures and laboratory work. Prerequisite: Animal Biology 1-2. Four credits. LYON, SCOTT, BEARD, McCLENDON.

104. PHYSIOLOGY OF THE NERVOUS SYSTEM AND SPECIAL SENSES; RESPIRATION, METABOLISM, NUTRITION, AND EXCRETION. Lectures and labora-

tory work. Prerequisite: Animal Biology 1-2. Four credits. LYON, SCOTT, BEARD, McCLENDON.

111. PHYSICAL CHEMISTRY OF CELLS. Osmotic pressure, surface tension and electric conductivity of blood and urine; colloids; permeability of cells and tissues and changes in permeability produced by electrolytes. Prerequisites: animal biology and two courses in chemistry. Three credits. McCLENDON.
112. ELECTROPHYSIOLOGY. The bio-electric currents and the theory of stimulation and narcosis. Hydrogen-ion concentration and its relation to enzyme activity and irritability. Prerequisites: animal biology and two courses in chemistry. Three credits. McCLENDON.
- 113-114. PROBLEMS IN PHYSIOLOGY. Arranged by instructors with qualified students. Each student will be assigned a topic for special laboratory study, leading in some cases to original investigation. Prerequisite: Physiology 103. Three credits or more. LYON, SCOTT, McCLENDON.
- 115-116. CONFERENCE COURSE IN PRINCIPLES OF PHYSIOLOGY. Student Seminar. Informal lectures and library study. Basis of study, Bayliss' textbook. Open to graduates and advanced undergraduates, 12 hours, each quarter; one and one-half credits, each semester. LYON, SCOTT, OR McCLENDON.
131. PHYSIOLOGY OF THE BLOOD. Alterations due to physiologic conditions. Methods of examination. Limited to sixteen students. Second quarter. One and one-half credits. SCOTT.
132. PHYSIOLOGY OF THE CIRCULATION. Conference and laboratory work. Limited to sixteen students. Conference may be taken separately. Third quarter. 24 or 48 hours. Three-fourths or one and one-half credits. SCOTT.
- 137a,b. FOODS AND PRACTICAL DIETETICS. A study of human foods and food values; principles of food selection; caloric indices and balanced dietaries. Exercises in the practical preparation of foods. Second quarter; repeated fourth quarter. Limited to twelve students. Prerequisite: Physiology 3 or equivalent. 40 hours. Two credits. BEARD.
138. PHYSIOLOGY OF DEVELOPMENT. The physiology of the ovum, the embryo, the fetus; the functions of menstruation, ovulation, pregnancy, parturition and lactation; the functional characteristics of birth, infancy, childhood, adolescence, maturity, and old age. Prerequisite: Physiology 3 or equivalent. 32 hours; two credits. BEARD.
139. EXAMINATION OF THE EYE AND EAR. A study of advanced methods. Lectures, demonstrations, and laboratory exercises. Prerequisite: Physiology 104. First quarter. 24 hours.

140. **PHYSIOLOGY OF ACCOMMODATION.** A study of optical principles and methods. Prerequisite: Physiology 104. Lectures, demonstrations, and laboratory exercises. Fourth quarter. 24 hours.
- 151-152. **PHYSIOLOGIC CHEMISTRY.** The components of the body, foods, digestion, and metabolism. Prerequisite: organic chemistry. Open to qualified students in all divisions of the University. 96 hours each semester. Six credits. KINGSBURY.
- 153-154. **ADVANCED PHYSIOLOGIC CHEMISTRY.** Course arranged by instructors with qualified students for special work. Either or both semesters may be elected. 96 hours, or more, either semester or both. Three credits or more. KINGSBURY, PETTIBONE.
161. **URINALYSIS.** Advanced methods. Prerequisite: physiologic chemistry. First quarter. 48 hours. One and one-half credits. PETTIBONE.
163. **METABOLISM.** Students are placed on known diets and the excreta are studied chemically. Prerequisite: physiologic chemistry. Second quarter. 48 hours. One and one-half credits. PETTIBONE.
164. **QUANTITATIVE METHODS.** The estimation of certain important substances in the urine, blood, and other body fluids. 96 hours. Three credits. KINGSBURY.
- 201-202. **SEMINAR IN PHYSIOLOGY AND PHARMACOLOGY.** For instructors and advanced students. 16 hours (one credit) each semester. LYON, HIRSCHFELDER, and Staff.
- 203-204. **RESEARCH IN PHYSIOLOGY.** LYON, SCOTT, MCCLENDON.
- 205-206. **RESEARCH IN PHYSIOLOGIC CHEMISTRY.** KINGSBURY, PETTIBONE.
208. **SEMINAR IN PHYSIOLOGIC OPTICS.** 24 hours. LYON.
210. **LABORATORY WORK IN PHYSIOLOGIC OPTICS.** 48 hours. LYON.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

- M251-252. **PHYSIOLOGIC CHEMISTRY.** Research work in problems related to metabolism; includes training in the use of methods of organic and inorganic analysis. KENDALL.

NOTE: For course in applied physiology, see announcement of the Department of Surgery.

#### ROENTGENOLOGY

Professor RUSSELL D. CARMAN; \* Assistant Professor ALEXANDER B. MOORE.

The course in roentgenology is designed to prepare selected men for advanced work in this specialty. Unless the prospective student's prep-



aration in normal anatomy, physiology, and pathology has been unusually good, at least a year should be spent in intensive study of these subjects before entering on the special three years' course.

MI51-152. GENERAL ROENTGENOLOGIC TECHNIC. Roentgenography; plates, intensifying screens, developers; stereoscopy; roentgenoscopy; vertical, horizontal. CARMAN, MOORE.

MI53-154. SPECIAL APPLICATIONS OF ROENTGENOLOGY. The osseous system, chest and lungs, urinary system, pyelography; gastro-intestinal tract. CARMAN, MOORE.

MI55-156. ROENTGEN THERAPY. Superficial, deep; technic; apparatus; filters; dosage and measurements; cross firing; protection. CARMAN, MOORE.

MI57-158. DANGERS OF THE ROENTGEN RAY. Effect upon tissues, normal and pathologic; protection, operator, patient; roentgen dermatitis, cause, results, treatment. CARMAN, MOORE.

M251-252. ELECTROPHYSICS. Electricity and magnetism, phenomena, nature and properties; source of electric energy; types of currents, continuous and alternating; units of electric measurement; resistance; Ohm's Law; voltage, amperage, and wattage; the static machine; the induction coil; interrupters; condensers; the interrupterless transformer. CARMAN, MOORE.

M253-254. PHYSICS OF THE ROENTGEN RAY. History, nature, and phenomena; the vacuum tube; the roentgen tube; types, penetration, measurements. CARMAN, MOORE.

M255-256. INTERPRETATION OF ROENTGENOLOGIC FINDINGS. Normal, abnormal; roentgen signs of disease, direct, indirect; correlation of plate and screen observations; correlation of clinical and roentgen findings. CARMAN, MOORE.

## SURGERY†

(Including General Surgery, Experimental Surgery, Orthopedic, and Genito-Urinary Divisions)

Professors WILLIAM F. BRAASCH,\* ARTHUR J. GILLETTE, CHARLES H. MAYO,\* JAMES E. MOORE; Associate Professors DONALD C. BALFOUR,\* J. FRANK CORBETT, MELVIN S. HENDERSON,\* EDWARD S. JUDD,\* ARTHUR A. LAW, ARTHUR T. MANN, FRANK C. MANN,\* WALTER E. SISTRUNK,\* Assistant Professors EMIL S. GEIST, JAMES C. MASSON,\* ARTHUR C. STRACHAUER; Instructors JOHN L. CRENSHAW, HENRY W. MEYERDING.

The graduate courses listed below are designed to prepare selected men for general, orthopedic, or genito-urinary surgery. Since the field of

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† Dr. William J. Mayo, being a regent of the University, is not a member of the instructional staff. His services in instruction and consultation, however, are available.

surgery is so generally overcrowded, the young man who would attain eminence therein must either possess great genius or supplement an excellent general medical training with at least three years' work in surgical anatomy, surgical pathology, surgical diagnosis and surgical treatment. Unless his previous training in anatomy has been unusually good, one or two semesters may be spent very profitably in an intensive study of this subject before the special three years' graduate work is undertaken. General surgery is a major subject and may not be taken as a minor.

#### A. COURSES OFFERED AT MINNEAPOLIS AND ST. PAUL

- 101-102. **ADVANCED MINOR SURGERY.** The student is required to assist in the dispensary (outpatient) surgical clinic, and in this connection makes a special study of the diagnosis and treatment of selected cases. STRACHAUER.
103. **OPERATIVE SURGERY ON THE CADAVER.** The technic of abdominal incision and closure; of bowel suturing, appendix removal, kidney exploration, nephrotomy, tracheotomy, amputations, ligations, etc. Graduate students act as laboratory assistants, and may work out upon the cadaver various independent problems in emergency surgery. CORBETT.
- 105-106. **EXPERIMENTAL SURGERY.** A study of surgical technic by cardinal operations upon animals. CORBETT.
108. **TUMORS.** The surgical pathology and diagnosis of tumors, classified by anatomical relation. CORBETT.
110. **SURGICAL PROBLEMS.** A study of selected surgical problems by operative, physiological, histological, or chemical methods. CORBETT.
112. **LOCAL ANESTHESIA.** Methods and application of local anesthesia in both major and minor surgery. STRACHAUER.
- 113-114. **SURGICAL DIAGNOSIS.** In this course the graduate student assists in the practical instruction of the clinical clerks and internes in the University Hospital, and makes a special study of problems in surgical diagnosis. MOORE.
- 115-116. **SURGICAL SERVICE.** The graduate student acts as house surgeon, and in connection with this service is required to make a special study of the patients, preparing them for clinics and observing them after operations. MOORE.
- 117-118. **OPERATIVE SURGERY.** In this course the surgical fellow acts as first assistant at all operations by the surgical staff at the University Hospital. When properly qualified, the fellow will be permitted to operate, beginning with simpler surgical procedures. MOORE, LAW, STRACHAUER.

- 119-120. ORTHOPEDIC SERVICE. Three months' service as house surgeon in the State Hospital for Crippled and Deformed Children at Phalen Park. Special facilities for the study of orthopedic diagnosis and treatment. GILLETTE.
- 201-202. SURGICAL RESEARCH. Properly qualified students may undertake original investigation of problems in either experimental or clinical surgery. The work may be used for thesis purposes. MOORE, CORBETT, LAW, STRACHAUER.
- 203-204. SURGICAL SEMINAR. Weekly conference for reports on surgical literature, with presentation and discussion of especially interesting cases and research work by members of the surgical staff. MOORE.

B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

- MI51-152. EXPERIMENTAL SURGERY. The purpose of this course is to develop technic for special operative work. Open to fellows in surgery. MANN.
- MI55-156. POST-OPERATIVE CARE OF PATIENTS. Treatment of complications, surgical and medical. BALFOUR.
- MI57-158. OPERATIVE SURGERY. Second assistantship in operating rooms; occasional substitute service as first assistant. Total service, one year general surgery. MAYO, ADSON, BALFOUR, HEDBLOM, JUDD, PEMBERTON, SISTRUNK.
- Regular first assistants on surgical service in the Mayo Clinic will be selected from men who have completed the three years' fellowship service in general surgery.
- MI59-160. SURGERY OF THE ABDOMINAL ORGANS AND THE DUCTLESS GLANDS. Operative technic; study of special problems involved. MAYO.
- MI61-162. SURGERY OF THE ABDOMINAL AND GENITO-URINARY ORGANS. Operative technic; study of special problems involved. JUDD.
- MI63-164. SURGERY OF THE GASTRO-INTESTINAL TRACT AND PELVIC ORGANS. Operative technic; study of special surgical problems. BALFOUR.
- MI65-166. SURGERY OF THE THORACIC ORGANS. Operative technic; study of special problems involved. HEDBLOM.
- MI69-170. ORTHOPEDIC DIAGNOSIS. History-taking and physical examination of orthopedic cases. HENDERSON, MEYERDING.
- MI71-172. ORTHOPEDIC TECHNIC. Study of braces, material and construction, measurement and fitting; application and use of plaster of Paris; radiography of orthopedic cases; care of non-surgical orthopedic cases. HENDERSON, MEYERDING.

M173-174. **ORTHOPEDIC SURGERY.** After service as assistant in general surgery, service may be chosen as second assistant in orthopedic surgery, with occasional substitute service as first assistant in orthopedic surgery. This service gives opportunity for the special study of selected cases, and the after-care of surgical cases. HENDERSON, MEYERDING.

One year or more of service is offered for those desiring to specialize in orthopedic surgery; three months' service for those desiring a limited training in orthopedic surgery as part of a general course in surgical diagnosis.

M175-176. **UROLOGIC DIAGNOSIS.** Cystoscopic examination and history-taking in diseases of the genito-urinary tract. BRAASCH, CRENSHAW.

M177-178. **CYSTOSCOPY, PROCTOSCOPY, AND URETHROSCOPY.** Cystoscopic and proctoscopic examination; pyelography; intravesical operations; fulguration. BRAASCH, CRENSHAW.

One year or more of service is offered for those desiring to specialize in urology; three months' service for those desiring a limited training in urology as part of a general course in surgical diagnosis.

M179-180. **ROENTGEN PLATE READING.** With special reference to cystoscopy (Daily). Open to fellows in the department. BRAASCH.

M251-252. **APPLIED PHYSIOLOGY.** Experimental physiology as applied to surgical problems. Open to fellows in surgery, medicine, and pathology. MANN.

M253-254. **APPLIED PATHOLOGY.** Experimental pathology as applied to surgical problems. Open to fellows in pathology, medicine, and surgery. MANN.

M255-256. **SURGICAL RESEARCH.** Investigation of special problems in surgery. Open only to fellows of the department. MANN.

M259-260. **SURGICAL RESEARCH.** Investigation of problems in various divisions of general surgery and surgical specialties. Staff.

M261-262. **SURGICAL SEMINAR.** Conference for the discussion of original work, problems and surgical literature. Staff.

M263-264. **SEMINAR IN ORTHOPEDIC SURGERY.** Open to fellows of the department. (Weekly.) HENDERSON.

M265-266. **SEMINAR IN UROLOGY.** (Weekly.) BRAASCH.

**NOTE:** For courses in surgical anatomy, pathology, clinical diagnosis, surgery of the eye, ear, nose, and throat, and roentgen plate reading, see announcements of corresponding departments.

# GRADUATE STUDENTS IN MEDICINE

1917-1918

Names and Degrees	Date of Entrance	Major	Minor
Adair, Fred L., B.S., M.D.....	Feb. 27, 1915	Anatomy ...	Pathology
*Adson, Alfred Washington, B.S., M.D...	July 1, 1914	Surgery .....	Pathology
Alley, Albert G., M.D.....	Sept. 27, 1916	Pediatrics ...	Chemistry
*Ashby, Winifred Mayer, B.S., M.S.....	Feb. 1, 1917	Bacteriology..	Pathology
*Baird, Burton Argyle, B.S., M.D.....	Aug. 16, 1917	Surgery .....	Pathology
Barry, Lee Willis, M.D.....	Sept. 23, 1916	Obstetrics ...	Anatomy
*Bartlett, Emily M., B.A., M.A.....	Feb. 26, 1918	Anatomy ...	.....
Benton, Anne Gertrude, B.A.....	Sept. 12, 1914	Bacteriology..	Physiol. Chem.
Binger, Henry Ernest, M.D.....	Nov. 10, 1914	Ophthalmology	Anatomy
*Black, Samuel Orr, B.A., M.D.....	April 10, 1917	Surgery .....	.....
*Blanco, Pio, B.S., M.D.....	June 18, 1917	Surgery .....	Anatomy
*Bragdon, James Chester, B.A., M.D....	Feb. 1, 1917	Surgery .....	Pathology
Broders, Albert Compton, M.D.....	Oct. 1, 1915	Pathology ...	Bacteriology
*Buie, Louis Arthur, B.A., M.D.....	Feb. 1, 1917	Surgery .....	Pathology
*Bumpus, Hermon, Jr., Ph.B., M.D.....	July 1, 1915	Surgery .....	Pathology
*Butsch, John Louis, M.S., M.D.....	July 1, 1916	Surgery .....	Urology
*Clark, Charles Milton, B.S., M.D.....	Aug. 1, 1917	Oto-Laryngology .....	.....
Clark, Gordon McCall, B.S., M.D.....	July 1, 1917	Obstetrics ...	Anatomy
Connor, Charles E., B.A., M.A., M.D...	Feb. 14, 1917	Ophthalmology	Anatomy
Crafts, Earl, B.S., M.D.....	Feb. 8, 1918	Surgery .....	Anatomy
*Crenshaw, John Lewis, M.D.....	June 1, 1910	Urology .....	Röntgenology
*Dederer, Carlton, B.A., M.D.....	June 6, 1916	Surgery .....	Pathology
Diehl, Harold Sheely, B.A.....	Oct. 31, 1916	Bacteriology..	Pathology
*Doe, Charles Herbert, M.D.....	May 1, 1915	Surgery .....	Pathology
*Dougherty, John Phillip, B.A., M.D....	Sept. 12, 1917	Medicine .....	.....
*Evans, Raymond Myers, B.S., M.D.....	July 1, 1916	Surgery .....	Pathology
*Ferrier, Paul Alexander, B.A., M.D....	July 1, 1915	Surgery .....	Pathology
*Foster, Joab Palmer, B.S., M.S.....	Jan. 1, 1918	Surgery .....	Physiology
*France, Marion, B.A.....	Aug. 13, 1917	Bacteriology..	Pathology
*Freligh, Wilfred Protacio, B.A., M.D...	July 1, 1914	Surgery .....	Pathology
*Fricke, Willa May, B.A., M.D.....	Aug. 1, 1915	Bacteriology..	.....
*Froehlich, John Alfred, M.D.....	Jan. 1, 1918	Surgery .....	Pathology
*Gauss, Julius H. P., B.A., M.D.....	Nov. 1, 1917	Medicine .....	.....
Guha, Upendranarayan, L.C. ....	Feb. 7, 1917	Bacteriology..	.....
Gutsell, Robert S., B.A.....	Oct. 20, 1917	Anatomy ...	Biology
*Hallenbeck, Dorr Foster, M.D.....	Oct. 1, 1915	Medicine ...	Surgery
*Harrington, Stuart William, M.D.....	Jan. 1, 1915	Surgery .....	Pathology
*Hartman, Howard Russell, B.S., M.D...	July 1, 1914	Surgery .....	Pathology
*Hayes, James Martin, B.S., M.D.....	Oct. 1, 1916	Surgery .....	.....
*Hedblom, Carl Arthur, M.A., M.D.....	Oct. 1, 1915	Surgery .....	Pathology
Hermann, Siegfried F., B.S. ....	Oct. 20, 1917	Bacteriology..	Pathology
*Hoke, Clarence Calvin, M.A., M.D.....	Feb. 1, 1917	Surgery .....	.....
*Horgan, Edmund Joseph, M.D.....	Jan. 1, 1915	Surgery .....	Pathology
*Howe, Edwin Marius, Ph.B., M.D.....	April 13, 1918	Surgery .....	.....
*Hundling, Herman William, B.S., M.D...	Aug. 28, 1917	Surgery .....	Pathology
*Hunt, Verne Carlton, B.S., M.D.....	April 1, 1915	Surgery .....	Pathology
Jones, Hugh T., B.S., B.A.....	Feb. 28, 1918	Pathology ...	.....
*Joshie, Nielamber C., M.D.....	Aug. 1, 1917	Surgery .....	.....
*Kennedy, Edith, B.A.....	Aug. 1, 1917	Chemistry ...	.....

\* Registered at Rochester (Mayo Foundation).



Names and Degrees	Date of		Major	Minor
	Entrance			
Kittelson, John A., B.S., M.A.....	Sept. 22, 1915	Anatomy ....	Pathology	
Lange, Alfred E., B.S.....	Feb. 28, 1918	Pharmacology .....		
Langenderfer, Victor L., M.D.....	Oct. 20, 1917	Ophthalmology	Pathology	
*Lepper, Lawrence Ewald, M.D.....	June 1, 1917	Surgery .....	Pathology	
*Looney, John Joseph Williams, M.D....	Oct. 1, 1914	Ophthalmology .....		
*Luden, Georgine (Arzt), M.D.....	Jan. 1, 1914	Pathology ...	Physiol. Chem.	
*Lyons, Horace Raymond, M.D.....	July 1, 1917	Oto-Laryngology .....		
*McEvoy, Frank Edward, M.S., M.D....	Feb. 1, 1916	Surgery .....	Pathology	
McKinley, John C., B.S., M.A.....	Sept. 8, 1915	Anatomy ....	Pathology	
*McLeod, John Roderick, B.S.....	Sept. 1, 1917	Chemistry ...		
*McVay, James Robert, B.A., M.A., M.D.	Oct. 1, 1915	Surgery .....	Pathology	
*Mark, Arthur Edward, B.S., M.D.....	Sept. 28, 1916	Medicine ....	Pathology	
*Masson, James Carruthers, M.D.....	April 1, 1914	Surgery .....	Medicine	
*Mastin, Edward Vernon, M.D.....	Sept. 12, 1917	Surgery .....		
*Mattson, William Whitelock, M.D.....	April 1, 1915	Surgery .....	Pathology	
*Meyerding, Henry William, B.S., M.D..	July 1, 1910	Orthopedic		
		Surgery....	Bacteriology	
*Miller, Albert, B.A., M.D.....	Jan. 1, 1913	Roentgenology	Pathology	
*Murray, George Aloysius, B.A., M.D....	Feb. 15, 1918	Surgery .....	Pathology	
Nelson, Orville N., B.S.....	Feb. 25, 1918	Pathology ...	Bacteriology	
Nixon, Charles Edward, B.A., M.D.....	June 21, 1917	Neurology ..	Pathology	
Norris, Edgar H., B.S., M.A.....	Oct. 1, 1915	Anatomy ....	Pathology	
Olson, Frederick A., B.A., M.D.....	Dec. 1, 1909	Surgery .....	Urology	
Ott, Martin D., A.B.....	Oct. 19, 1917	Anatomy ....	Biology	
*Ott, William Oscar, B.S., M.D.....	July 1, 1916	Surgery .....	Pathology	
Osterud, Hjalmar L., B.A., M.A.....	Oct. 15, 1917	Anatomy ....	Biology	
*Owens, Esther M., B.A.....	Sept. 20, 1915	Pathology ...	Physiology	
Pearce, Naboth Osborne, M.D.....	Feb. 7, 1917	Pediatrics ...	Chemistry	
*Pemberton, John deJarnette, B.A., M.D.	May 1, 1913	Surgery .....	Pathology	
*Place, Margaret Ethel, B.A.....	July 1, 1917	Bacteriology..	Pathology	
*Plummer, William Albert, M.D.....	June 1, 1910	Medicine ....	Physiology	
*Pollock, Lee Wesley, B.S., M.D.....	Nov. 16, 1914	Medicine ....	Pathology	
*Rankin, Fred Wharton, B.A., M.D.....	Oct. 1, 1916	Surgery .....	Pathology	
*Redclings, Leslie Hall, B.S., M.S., M.D.	Oct. 1, 1915	Surgery .....	Pathology	
*Reeves, Thaddeus Benjamin, B.S., M.D.	Feb. 1, 1916	Medicine ....	Pathology	
Robinson, Byron L., B.A., M.A.....	Feb. 16, 1917	Anatomy ....	Biology	
*Ronzone, Ethel, B.S., M.A.....	Feb. 21, 1918	Physiology ..	Anatomy	
*Sandiford, Irene, B.A.....	Aug. 1, 1917	Medicine ....		
Schlutz, Frederic W., B.A., M.D.....	Nov. 20, 1911	Chemistry ...	Anatomy	
*Shepard, John Hunt, B.S., M.D.....	March 1, 1917	Surgery .....	Pathology	
*Smith, Arthur Andrew, B.A., M.D.....	April 15, 1918	Surgery .....	Pathology	
Smith, Taylor Bivens, B.A., M.D.....	July 1, 1917	Surgery .....	Anatomy	
*Stacy, Leda June, M.D.....	Feb. 1, 1908	Medicine ....	Pathology	
*Sutton, George Douglas, B.S., M.A.....	Oct. 1, 1915	Surgery .....	Pathology	
*Sweet, Paul Williams, B.A., M.D.....	June 15, 1917	Surgery .....	Anatomy	
*Szlapka, Thaddeus Louis, B.S., M.D....	Oct. 1, 1915	Surgery .....	Pathology	
*Tate, Marianne, B.A.....	July 1, 1917	Pathology ...	Bacteriology	
*Tucker, William Joseph, M.A., M.D....	July 20, 1916	Surgery .....	Pathology	
*Vinson, Porter Paisley, M.A., M.D....	Sept. 1, 1916	Medicine ....	Pathology	
*VonHess, Charles Leonard, B.S., M.D..	May 1, 1917	Medicine ....		
Wagner, Henry Patrick, B.S., M.D.....	July 15, 1917	Ophthalmology .....		
*Walker, James Cloudsley, M.D.....	Oct. 1, 1915	Orthopedics..	Pathology	
*Wattawa, Katherine E., B.S.....	Aug. 13, 1917	Bacteriology..	Pathology	
*Weaver, Samuel Dinwiddie, M.D.....	July 1, 1917	Surgery .....	Gynecology	
*Weld, Edward Howland, B.A., M.D....	Feb. 1, 1916	Surgery .....	Pathology	

\* Registered at Rochester (Mayo Foundation).

Names and Degrees	Date of Entrance	Major	Minor
*Weyrens, Joseph Peter, B.S., M.D.....	May 1, 1917	Surgery .....	Pathology
*White, Paul Amos, B.S., Ph.B., M.D....	July 15, 1917	Surgery .....	.....
*Wiese, Henning F. B., M.D.....	April 1, 1918	Surgery .....	Pathology
*Willius, Frederick Arthur, B.S., M.D....	July 1, 1915	Medicine ....	Physiology
*Wilson, Florence Fleet, B.A.....	Jan. 1, 1918	Bacteriology..	Medicine
*Wolf, Edna M., Ph.B.....	Feb. 27, 1918	Physiology ..	Chemistry
Yates, Anne B., B.A., M.A.....	Oct. 25, 1917	Physiology ..	Bio-chemistry

\* Registered at Rochester (Mayo Foundation).

The following degrees were awarded in the Medical Group at the Commencements of 1917 and 1918.

(The degree of Doctor of Science is no longer awarded.)

#### 1917

##### MASTER OF ARTS

Gault, Charles C., B.A. (Major: Physiology)  
 Kittelson, John A., B.S. (Major: Anatomy)  
 McKinley, John C., B.S. (Major: Anatomy)

##### MASTER OF SCIENCE

Crispin, Egerton L., Ph.B., M.D. (Major: Surgery)  
 Drips, Della G., B.A. (Major: Pathology)  
 McMahon, Dorothy F., B.S. (Major: Pathology)  
 McMahon, Francis B., B.S., M.D. (Major: Surgery)

##### DOCTOR OF PHILOSOPHY

Stewart, Chester A., B.A., M.A. (Major: Anatomy)

##### DOCTOR OF PHILOSOPHY IN SURGERY

McWhorter, Golder L., B.S., M.D.

##### DOCTOR OF SCIENCE

Morris, Ralph E., M.D.

##### DOCTOR OF SCIENCE IN NEUROLOGY

Woltmann, Henry W., B.S., M.D.

##### DOCTOR OF SCIENCE IN PEDIATRICS

Taylor, Rood, M.D.

#### 1918

##### MASTER OF ARTS

Adair, Fred L., B.S., M.D. (Major: Anatomy)  
 Benton, Anne, B.A. (Major: Bacteriology)

##### MASTER OF SCIENCE IN ORTHOPEDIC SURGERY

Meyerding, Henry W., B.S., M.D.

##### MASTER OF SCIENCE IN SURGERY

Adson, Alfred W., B.S., M.D.  
 Hunt, Verne C., B.S., M.D.  
 Olson, Frederick A., A.B., M.D.  
 Pemberton, John de J., A.B., M.D.









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# *The Bulletin of the University of Minnesota*

*The Graduate School  
Announcement of Graduate Work  
in Medicine in the Medical School  
and the Mayo Foundation  
1919-1920*



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Act of October 3, 1917, authorized July 12, 1918*

1919							1920													
JULY							JANUARY							JULY						
Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa	Su	Mo	Tu	W	Th	Fr	Sa
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19	20	21	22	23	24	25	18	19	20	21	22	23	24	17	18	19	20	21	22	23
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14	15	16	17	18	19	20	13	14	15	16	17	18	19	13	14	15	16	17	18	19
21	22	23	24	25	26	27	20	21	22	23	24	25	26	20	21	22	23	24	25	26
28	29	30	31	..	..	..	27	28	29	30	..	..	..	27	28	29	30	31	..	..

# UNIVERSITY CALENDAR

1919-1920

1919

September	20	Saturday	Payment of fees closes, except for new students
September	24-30	Week	Examinations for removal of conditions, and entrance examinations
September	29	Monday	First semester evening extension classes begin
September	29-30		Registration days
September	30	Tuesday	Payment of fees for new students closes
October	1	Wednesday	Fall quarter begins
October	16	Thursday	Senate meeting, 4:00 p.m.
November	27	Thursday	Thanksgiving Day; a holiday
December	18	Thursday	Senate meeting, 4:00 p.m.
December	23	Tuesday	Christmas vacation begins 9:00 p.m.
1920			
January	2	Friday	Christmas vacation ends 8:30 a.m.
January	2	Friday	Winter quarter begins
January	23	Friday	First semester evening extension classes close
February	2	Monday	Second semester evening extension classes begin
February	12	Thursday	Lincoln's Birthday; a holiday
February	19	Thursday	Senate meeting, 4:00 p.m.
March	25	Thursday	Winter quarter ends
April	1	Thursday	Spring quarter begins
April	2	Friday	Good Friday; a holiday
May	20	Thursday	Senate meeting, 4:00 p.m.
May	21	Friday	Second semester evening extension classes close
June	13	Sunday	Baccalaureate service
June	16	Wednesday	Spring quarter closes
June	17	Thursday	Forty-eighth Annual Commencement
June	18-19		Registration days for Summer quarter
June	21	Monday	Summer quarter begins
September	3	Friday	Summer quarter closes

# GRADUATE WORK IN MEDICINE

## ORGANIZATION

The graduate work in medicine in the Medical School and the Mayo Foundation is a part of the work of the Graduate School of the University. Its management is entrusted by the Board of Regents to a committee composed as follows:

The President of the University, MARION LEROY BURTON, Ph.D., D.D., LL.D.

The Dean of the Graduate School, GUY STANTON FORD, Ph.D.

The Dean of the Medical School, ELIAS POTTER LYON, Ph.D., M.D.

The Director of the Mayo Foundation, LOUIS B. WILSON, M.D.

LEONARD G. ROWNTREE, M.D., Sc.D., of the Medical School

JULIUS P. SEDGWICK, M.D., of the Medical School

CLARENCE MARTIN JACKSON, M.S., M.D., of the Medical School

JENNINGS C. LITZENBERG, B.S., M.D., of the Medical School

DONALD C. BALFOUR, M.D., of the Mayo Foundation

WILLIAM F. BRAASCH, B.S., M.D., of the Mayo Foundation

MELVIN S. HENDERSON, M.D., of the Mayo Foundation

## FACULTY

MARION LEROY BURTON, Ph.D., D.D., LL.D., President

GUY STANTON FORD, Ph.D., Dean of the Graduate School

DONALD C. BALFOUR, M.B., M.D., Associate Professor of Surgery (Mayo Foundation)

RICHARD O. BEARD, B.S., M.D., Associate Professor of Physiology

ELEXIOUS T. BELL, B.S., M.D., Associate Professor of Pathology

WILLIAM L. BENEDICT, M.D., Assistant Professor of Ophthalmology (Mayo Foundation)

WAYNE W. BISSELL, B.S., M.D., Assistant Professor of Pathology (Mayo Foundation)

WALTER M. BOOTHBY, M.A., M.D., Assistant Professor of Medicine (Mayo Foundation)

WILLIAM F. BRAASCH, B.S., M.D., Professor of Urology (Mayo Foundation)

EDGAR D. BROWN, Ph.D., M.D., Associate Professor of Pharmacology

FRANK E. BURCH, M.D., Assistant Professor of Ophthalmology and Otolaryngology

RUSSELL D. CARMAN, M.D., Professor of Roentgenology (Mayo Foundation)

J. FRANK CORBETT, M.D., Associate Professor of Experimental Surgery

GEORGE B. EUSTERMAN, M.D., Assistant Professor of Medicine (Mayo Foundation)

- \*CARL FISCHER, B.S., M.D., Associate Professor of Ophthalmology and Otology (Mayo Foundation)
- BOYD S. GARDNER, M.D., Assistant Professor of Dental Surgery, Mayo Foundation
- EMIL S. GEIST, M.D., Assistant Professor of Orthopedic Surgery
- HERBERT Z. GIFFIN, B.S., M.D., Associate Professor of Medicine (Mayo Foundation)
- ARTHUR J. GILLETTE, M.D., Professor of Orthopedic Surgery
- ARTHUR S. HAMILTON, M.D., Professor of Mental and Nervous Diseases
- ERNEST M. HAMMES, M.D., Assistant Professor of Mental and Nervous Diseases
- THOMAS B. HARTZELL, D.D.M., M.D., Research Professor in Mouth Infections
- MELVIN S. HENDERSON, M.B., M.D., Associate Professor of Orthopedic Surgery (Mayo Foundation)
- ARTHUR T. HENRICI, M.D., Assistant Professor of Bacteriology
- ARTHUR D. HIRSCHFELDER, B.S., M.D., Professor of Pharmacology
- EDGAR J. HUENEKENS, M.D., Assistant Professor of Pediatrics
- CLARENCE M. JACKSON, M.S., M.D., Professor of Anatomy
- JOHN B. JOHNSTON, Ph.D., Professor of Comparative Neurology
- EDWARD S. JUDD, M.D., Associate Professor of Surgery (Mayo Foundation)
- EDWARD C. KENDALL, Ph.D., Associate Professor of Biochemistry (Mayo Foundation)
- FRANCIS B. KINGSBURY, Ph.D., Assistant Professor of Physiologic Chemistry
- WINFORD P. LARSON, M.D., Associate Professor of Bacteriology
- ARTHUR A. LAW, M.D., Associate Professor of Surgery
- THOMAS G. LEE, B.S., M.D., Professor of Comparative Anatomy
- HAROLD I. LILLIE, B.A., M.D., Assistant Professor of Otology, Rhinology, and Laryngology (Mayo Foundation)
- JENNINGS C. LITZENBERG, B.S., M.D., Professor of Obstetrics and Gynecology
- ARCHIBALD H. LOGAN, M.D., Associate Professor of Medicine (Mayo Foundation)
- ELIAS P. LYON, Ph.D., M.D., Professor of Physiology
- JESSE F. MCCLENDON, Ph.D., Associate Professor of Physiology
- WILLIAM C. MACCARTY, M.S., M.D., Associate Professor of Pathology (Mayo Foundation)
- ARTHUR T. MANN, B.S., M.D., Associate Professor of Surgery
- FRANK C. MANN, M.A., M.D., Associate Professor of Experimental Surgery and Pathology (Mayo Foundation)
- JAMES C. MASSON, M.D., Assistant Professor of Surgery (Mayo Foundation)
- CHARLES H. MAYO, M.A., M.D., D.Sc., LL.D., Professor of Surgery (Mayo Foundation)

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\* Absent on leave.



- ALEXANDER B. MOORE, M.D., Assistant Professor of Roentgenology (Mayo Foundation)
- WILLIAM R. MURRAY, Ph.B., M.D., Associate Professor of Ophthalmology and Oto-Laryngology
- ROBERT D. MUSSEY, M.D., Assistant Professor of Medicine (Mayo Foundation)
- GORDON B. NEW, D.D.S., M.B., M.D., Assistant Professor of Rhinology, Laryngology, and Stomatology (Mayo Foundation)
- HORACE NEWHART, B.A., M.D., Assistant Professor of Ophthalmology and Oto-Laryngology
- CHAUNCEY J. V. PETTIBONE, Ph.D., Assistant Professor of Physiologic Chemistry
- HENRY S. PLUMMER, M.D., Professor of Medicine (Mayo Foundation)
- ANDREW T. RASMUSSEN, Ph.D., Assistant Professor of Neurology
- HAROLD E. ROBERTSON, B.A., M.D., Professor of Pathology
- EDWARD C. ROSENOW, M.D., Professor of Experimental Bacteriology (Mayo Foundation)
- LEONARD G. ROWNTREE, M.D., D.Sc., Professor of Medicine.
- ARTHUR H. SANFORD, M.A., M.D., Associate Professor of Clinical Bacteriology and Parasitology (Mayo Foundation)
- RICHARD E. SCAMMON, Ph.D., Professor of Anatomy
- FREDERICK H. SCOTT, Ph.D., M.B., D.Sc., Professor of Physiology
- JULIUS P. SEDGWICK, B.S., M.D., Professor of Pediatrics
- WALTER D. SHELDON, B.S., M.D., Associate Professor of Medicine (Mayo Foundation)
- WALTER E. SISTRUNK, Phm.G., M.D., Associate Professor of Surgery (Mayo Foundation)
- JOHN H. STOKES, B.A., M.D., Associate Professor of Dermatology (Mayo Foundation)
- ARTHUR C. STRACHAUER, M.D., Assistant Professor of Surgery
- ROOD TAYLOR, M.D., Ph.D. in Pediatrics, Assistant Professor of Pediatrics
- HENRY L. ULRICH, M.D., Associate Professor of Medicine
- S. MARX WHITE, M.D., Professor of Medicine
- LOUIS B. WILSON, M.D., Professor of Pathology (Mayo Foundation)
- ROY A. BARLOW, M.D., Instructor in Rhinology and Oto-Laryngology (Mayo Foundation)
- JOHN L. CRENSHAW, M.D., Instructor in Urology (Mayo Foundation)
- DORR F. HALLENBECK, M.D., Instructor in Medicine (Mayo Foundation)
- WILLIS S. LEMON, M.B., Instructor in Medicine (Mayo Foundation)
- HENRY W. MEYERDING, B.S., M.D., M.S. in Orthopedic Surgery, Instructor in Orthopedic Surgery (Mayo Foundation)
- JOHN DE J. PEMBERTON, B.A., M.D., M.S. in Surgery, Instructor in Surgery (Mayo Foundation)
- LEDA J. STACY, M.D., Instructor in Medicine (Mayo Foundation)
- HENRY W. WOLTMANN, B.S., M.D., Ph.D. in Neurology, Instructor in Medicine (Mayo Foundation)

## GENERAL INFORMATION

The graduate work in medicine here outlined is not intended for those seeking brief practitioners' or review courses. Opportunities of this kind are to be found in the Bulletin of the Medical School.

### HISTORY

In the fall of 1914, the University of Minnesota began graduate work in various fields of medicine and surgery in addition to that already offered for some time in the laboratory branches. The conditions laid down for this work as regards admission, residence, thesis, and examinations were those already applied by the Graduate School in approving all candidates for graduate degrees.

Since June, 1915, the Board of Regents have had at their command for this work, in addition to the facilities of the Medical School, the income and resources of the Mayo Foundation\* and of the staff, clinics, laboratories, library, and records at Rochester, Minnesota.

### PURPOSE

In an age of specialization and the development of graduate work in all fields and phases of the sciences, letters, and arts, such an educational experiment needs no elaborate justification. In a subject like medicine, intimately connected with established fields of research such as biology, chemistry, anatomy, physiology pathology, and bacteriology, the need for scientific research and for the training of scientific specialists, investigators, and teachers is as great as in any subject, and of as vital importance.

The possibilities of such work hitherto have suffered less from neglect than they have from the lack of organization, standardization, and certification by the educational institutions which have found it possible and advisable to put such applied subjects as agriculture, education, engineering, and commerce upon a scientific basis, and have freely recognized the accomplishments of trained students by the granting of higher earned degrees in these fields. In medicine, in the United States, the specialist in practice and the trained investigator have come to us either as a development from extended practice narrowing to a particular field;

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\* Research in pathology, clinical medicine, and surgery has been carried on at Rochester for several years. In 1912, definite three-year courses in these subjects for graduates in medicine were instituted. In order to perfect the organization and place the work on a permanent basis, February 9, 1915, a corporation, the Mayo Foundation for Medical Education and Research, was founded by Drs. William J. and Charles H. Mayo. On June 9, 1915, the University of Minnesota and the Mayo Foundation for Medical Education and Research entered into an agreement, by the terms of which the funds and income of the Mayo Foundation for Medical Education and Research are devoted, under the direction of the Regents of the University of Minnesota, to the promotion of graduate work in medicine and to research in this field. On September 13, 1917, the funds and income of the Mayo Foundation were transferred entirely to the Regents of the University.

by periods, long or short, of foreign study; by what has been called post-graduate or polyclinic medical courses; or by the simple and convenient method of self-proclamation. Taken as a whole, the results of such processes can hardly be called satisfactory, nor do they supply any sure protection to the public or any open avenue for the specialist to the public's confidence. And medical education, if it is to advance, must at least be able to supplement a faculty of skilled practitioners with men trained to carry forward the frontiers of medical science.

The objects of this graduate work in medicine are accordingly the training for medical practice of fully equipped and properly certified specialists and of investigators and teachers of medicine.

#### STANDARDS AND REQUIREMENTS

In entering upon this work the best methods for securing results and safeguarding scientific standards have, it would seem, already been indicated by the graduate work developed here and elsewhere in other pure and applied sciences. The proper development of any experiment in graduate work in medicine would then depend upon real standards of admission, qualified teachers supplied with adequate laboratory, clinical, and library equipment, and rigid tests in course and examinations in residence, together with evidence of the power of productive research on the part of the students as evidenced in a thesis.

In doing this work the University of Minnesota is not seeking to multiply the opportunities for securing simply technical training through practitioners' courses. The graduate work is definitely intended to make the three-years' work a training for the well-prepared and serious-minded student who wants to be a scientist, working in some special field of medicine or surgery. Entrance upon the work and continuance in it, as well as the holding of scholarships or fellowships in the Medical School or on the Mayo Foundation, will be strictly conditioned upon evidences of power and growth along scientific lines. The value of technical or mechanical skill as a practitioner or operator has its place, but will be subordinated to and measured by the power and product of the brain that guides the hand. From the standpoint of both the University and the prospective student it is highly important that this distinction in purpose be kept clearly in mind.

In the selection of graduate medical students, and in making appointments to fellowships for medical graduate work, preference will be given, other things being equal, to students who have done more than the usual amount of undergraduate medical work in the fundamental medical sciences (i.e., anatomy, physiology, pathology, etc.) through which they should make their approach to the specialty which they wish to take as a major subject.

By the present arrangement of courses in arts, science, and medicine, a properly prepared student may enter the University, and in seven years secure the usual doctorate degree in arts, in science or in medicine. The object of the new plan is to provide three years of additional work on

the basis of the degree of Doctor of Medicine, and leading to the special degrees of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) in Medicine, in Surgery, in Pathology, etc.

#### LABORATORY AND CLINICAL EQUIPMENT

The laboratory and clinical equipment for the prosecution of graduate work in medicine is located in Minneapolis, St. Paul, and Rochester.

The laboratory branches are well housed and in excellently equipped buildings on the campus at Minneapolis and in Rochester. Anatomy, chemistry, and pathology and bacteriology are in modern buildings especially designed for them. Physiology, physiological chemistry, and pharmacology are located in Millard Hall, a modern building of the best type. The laboratories for experimental medicine and surgery, and extensive animal quarters are also in this building.

The University owns and controls Elliot Memorial Hospital with its service building. This provides a clinic of 200 beds, and has the accumulated hospital records of nine years. The Out-Patient Department of the Hospital is housed in Millard Hall and received 15,163 new patients and 54,044 patients' visits during the year ending June 30, 1919. The University museums of anatomy, pathology, and surgery contain a large number of specimens available for teaching and study.

The State Hospital for the Crippled and Deformed at Phalen Park, St. Paul, offers the University full participation in its clinical opportunities.

The City Hospital of Minneapolis and the City and County Hospital of St. Paul, representing in all some 1,400 beds, exhibit every phase of clinical service in their wards and amphitheatres.

In Rochester, St. Mary's Hospital and other local hospitals at the disposal of the Mayo Foundation for Medical Education and Research aggregate 1,300 beds. These with the Mayo Clinic building and annexes include a modern and extensive equipment in laboratories, museums, and examining and operating rooms with equipment for roentgenologic, cardiographic, cytosopic, and photographic work. In the Mayo Clinic building there are thirty-nine experimental and research laboratories.

During 1918, 49,083 patients were examined clinically in Rochester. More than 300,000 clinical histories are on file. During 1918, 17,034 surgical operations were performed. A large percentage of post mortems is made. The working museum contains more than 75,000 pathologic specimens. All case histories and specimens are classified and arranged so as to be readily available for scientific research.

Arrangements have been made whereby fellows or other graduate students in Medicine may divide their time, part of their work being taken on the Mayo Foundation at Rochester, and part in the Medical School at Minneapolis and St. Paul.

#### LIBRARIES

Besides the University Library and the departmental libraries, there are at the disposal of the student the general medical libraries in Mil-



lard Hall and the Mayo Clinic Building, and the collections of the Hennepin County and Ramsey County Medical Societies. Current issues and complete files of most important medical periodicals are available either in Minneapolis or Rochester.

#### REGISTRATION AND NUMBER OF STUDENTS

Students entering upon graduate work in medicine will register with the Dean of the Graduate School. Students who begin their residence work in Rochester may fulfill the preliminary requirements by registering there with the Director of the Mayo Foundation.

The number of graduate students who will be registered for work is determined by the clinical opportunities. This limitation applies to those doing their major work in clinical medicine and surgery and not to those majoring in the laboratory departments.

#### TUITION

The tuition fee for the graduate work in clinical medicine and surgery is seventeen dollars per quarter. For students in the fundamental laboratory branches, the tuition fee is ten dollars per quarter. Extra fees may be charged to cover the cost of materials and supplies for exceptional laboratory experimentation. The fees for graduate work in the Summer Session are stated in the special Summer Session Bulletin. Fellows, scholars, and members of the teaching or scientific staff are exempt from tuition and fees.

#### FELLOWSHIPS AND SCHOLARSHIPS

Teaching fellowships in the Medical School are now established as follows: in surgery, two; in internal medicine, two; in obstetrics, two; in ophthalmology and oto-laryngology, two; in mental and nervous diseases, two; and in pediatrics, two. They carry a stipend of \$600 the first year, \$750 the second, and \$1,000 the third. These teaching fellows are required to devote their entire time (excepting an annual vacation of three weeks) to graduate work, including a small amount of teaching.

Similar teaching fellowships have been established in the fundamental laboratory department of the Medical School as follows: in anatomy (including histology and embryology), three; in physiology and physiological chemistry, one; in pharmacology, one. These fellowships carry a stipend of \$600 the first year, \$750 the second, and \$1,000 the third year. They require a small amount of teaching, the remainder of the time being devoted to graduate work leading to advanced degrees.

In addition, there are at Minneapolis five scholarships, without stipend, carrying free tuition with opportunity for graduate study in any of the clinical departments.

The attention of prospective medical graduate students is also called to the Shevlin Fellowship in Medicine yielding \$500 and tuition. Applications should be in the hands of the Dean of the Graduate School before March 1.

The Mayo Foundation carries the following fellowships: in clinical and experimental surgery, sixty; in clinical and experimental medicine,



twelve; in pathology, two; in bacteriology, two; in urology and proctology, four; in orthopedic surgery, dental surgery, neurology, ophthalmology and otology, rhinology and laryngology, and roentgenology, one each. In addition there are available, without stipend, opportunities for residence work in Rochester for twelve students majoring in clinical and experimental surgery, three in clinical and experimental medicine, two in pathology, and one in bacteriology. The fellowships pay \$600 the first year, \$750 the second, and \$1,000 the third year. They require full time, with an annual vacation of two weeks.

Nominations for fellowships upon the Mayo Foundation are made each quarter, beginning with July 1, for residence to begin six months later. In the Medical School appointments are made as vacancies occur.

All appointments are made for one year and renewable for a period of three years upon the basis of satisfactory progress in the work pursued. Requests for blanks for application for fellowships and scholarships should be addressed to the Dean of the Graduate School, University of Minnesota, Minneapolis, Minnesota, or to the Director of the Mayo Foundation, Rochester, Minn.

#### ASSISTANTSHIPS

A few qualified research assistants (not candidates for a degree) may be accepted at Rochester in the laboratory branches for short periods. The number is necessarily limited in order not to interfere with the work of the resident fellows, scholars, and students. Correspondence concerning this work should be directed to the Director of the Mayo Foundation, Rochester, Minnesota.

Several of the departments in the Medical School (including anatomy, physiology, and pathology) have paid assistantships which may furnish means of self-support while the holder is pursuing graduate work. For further information, address the Dean of the Medical School.

#### SUMMARY OF REQUIREMENTS

The various steps involved in the requirements for the degree of Doctor of Philosophy (Ph.D.) in any one of the clinical or laboratory departments are briefly summarized in the following. The requirements for the Master's degree (M.A. or M.S.) are also indicated. Further information concerning graduate work in general may be found in the general Graduate School Bulletin.

#### REQUIREMENTS FOR ADVANCED DEGREES IN MEDICINE

1. *Admission.*—All graduate students are admitted by the Dean of the Graduate School. Entrance upon work for the advanced degrees of Master of Science (M.S.) or Doctor of Philosophy (Ph.D.) in the clinical departments of medicine is limited to those who have: (a) the Bachelor's degree in arts or science, or its equivalent;\* (b) the degree of Doctor

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\* Students who have completed at least two years of pre-medical collegiate work, making an equivalent of the seven-years combined Arts-Medicine course at the University of Minnesota, are eligible for admission as graduate students.

of Medicine from acceptable institutions (i.e., those in Class "A" of the American Medical Association); and (c) one year's experience as an interne in an approved hospital or as an assistant in a laboratory in an acceptable medical school. In the fundamental laboratory sciences (anatomy, physiology, bacteriology, pathology, and pharmacology) properly prepared students may be admitted without (b) and (c) as candidates for the Master's degree (M.A. or M.S.) or the Doctor's degree (Ph.D.).

Upon entrance to the Graduate School, the candidate, with the approval of the Dean, will select his adviser in the field of his major work. With the approval of his adviser and the Dean, he will outline a study program for the year.

The study program for the second and third years is subject also to the approval of the Medical Group Committee.

2. *Residence.*—For the Doctor's degree (Ph.D.) at least three full years of successful graduate study are required, including certain special requirements noted below. For the Master's degree (M.S.) in clinical subjects, two or three years are required. For the Master's degree in the laboratory sciences only one year of residence is required.

3. *Language requirements.*—A reading knowledge of French and German must be certified by the professors in charge of these languages at least one year before the Doctor's degree is conferred, and before admission to the preliminary examination. For the Master's degree in the laboratory sciences, a reading knowledge of only one foreign language is required, which must be certified before the end of the second quarter. For the Master's degree (M.S.) in the clinical branches, the language certificate is optional.

4. *Minor.*—With the approval of his adviser and the Dean of the Graduate School, each student upon entrance selects a minor, which must be logically related to his major subject, and (for the Doctor's degree) must be completed before the end of the second year. The minor is preferably a laboratory subject in some other department, and should amount to not less than one sixth of the total work for the degree. At least one fourth of the work offered for the degree in a clinical subject should consist of graduate work in the fundamental laboratory branches, which will serve as a basis for the proposed clinical specialization. This fundamental work should be concentrated in the first part of the course so far as possible. The final examination in the minor for the Doctor's degree is included in the preliminary examination, as noted below. For the Master's degree no special examination is required in the minor, aside from the usual course examinations.

5. *Major.*—The major is that department in which the student desires to specialize. Together with the thesis, it should occupy at least two thirds of the total work for the degree. At least one year before attaining the Doctor's degree, the following procedure is required in order that the candidate may become eligible for the preliminary examination. In addition to the completion of the minor work and of the language

requirement, he must have the written approval of the department committee (which includes the Graduate Faculty members) of the major subject. The statement of the department committee should include the subject of the special problem for the thesis, and should certify as to the ability of the candidate to meet all requirements for the degree sought.

6. *Admission to candidacy.*—For the Master's degree, students who have met the language requirement and whose thesis subject has been properly approved are admitted to candidacy at the end of the second quarter by vote of the Executive Committee of the Graduate School. For the Doctor's degree, the student is required to pass a preliminary examination, as noted below, before admission to candidacy.

7. *Preliminary examination.*—At least one calendar year before the Doctor's degree is conferred, a preliminary examination of the student shall be given by a committee consisting of the student's adviser as chairman, a representative of the Medical Graduate Committee (other than the adviser) and all members of the Graduate Faculty in his major and minor departments. Certificates of proficiency in French and German, completion of the minor work and the recommendation of the major department shall be required before admission to this examination. The examination is in addition to the usual course examinations. It shall cover the graduate work previously taken by the student, *and may include any work fundamental thereto*. The examination may be either written or oral, or both, as determined by the examining committee. Only after the successful completion of this examination may the student be enrolled as a candidate for the Doctor's degree. Students failing to pass this preliminary examination shall not be reexamined until at least one quarter has passed.

8. *Thesis.*—Each candidate for an advanced degree (Master's or Doctor's) must submit a thesis. For the Master's degree, the subject of the thesis should be filed with the Dean of the Graduate School by November 15. The subject must be approved by the adviser and by the Medical Graduate Committee. The topic should be within the field of the major, and the thesis should represent approximately half of a year's work of the student. The thesis must be written in acceptable English. It must show ability to work independently, give evidence of power of independent thought both in perceiving problems and in making satisfactory progress toward their solution. Familiarity with the bibliography of the special field and correct citation of authorities are expected.

The Master's thesis must be typewritten in triplicate, one copy on a special form of linen stock, the other two as carbon copies. Samples of the paper required should be examined in the Dean's office. The three copies of the thesis must be filed in the Dean's office not later than six weeks before graduation. The thesis will be examined by a committee appointed by the Dean, on recommendation of the Medical Graduate Committee. Unanimous approval by the thesis committee is necessary for the acceptance of the thesis. If the thesis is accepted, the candidate

must deposit with the Registrar, at least one week before Commencement, the sum of one dollar for binding one copy of the thesis, which will be cataloged and deposited in the University Library.

For the Doctor's degree, a more elaborate thesis is required. The subject is to be stated in the written department recommendation, which precedes the preliminary examination at the end of the second year. The accumulation of material for the thesis should be started much earlier. The thesis must give evidence of originality and power of independent investigation. It must embody results of research forming a real contribution to knowledge and must exhibit a mastery of the literature of the subject and a familiarity with the sources of knowledge. The matter must be presented with a fair degree of literary skill.

The thesis must be typewritten in triplicate, to facilitate reading by the thesis committee. No special size or form is required for the Doctor's thesis, since it is to be printed subsequently. The three copies must be filed in the Dean's office not later than six weeks before graduation. The Dean will appoint a thesis committee with the student's adviser as chairman. Unanimous approval by this committee will be necessary for the acceptance of the thesis. If the thesis is accepted, the candidate must deposit with the Registrar, not later than one week before Commencement, a sufficient bond or such sum of money as will be required to print 100 copies of the thesis for the use of the University and as many additional copies as the candidate may require for himself. If the thesis is to be published elsewhere, reprints will be acceptable, if bound with covers in the special form required by the University.

9. *Final written examination.*—In addition to the usual course examinations in all subjects where such are given, the candidate for the Master's degree must pass a final written examination in the field of the major. (No *special* final examination is required in the minor.) The final written examination will be held not later than four weeks before Commencement. It is given by the members of the Graduate Faculty in the major department, the adviser acting as chairman. This examination shall cover all the work done in the major, and may include any work fundamental thereto.

For the Doctor's degree, a final written examination in the major subject is similarly given, after the thesis is presented and at least four weeks before Commencement.

10. *Final oral examination.*—If all other requirements for the degree have been met, including the final written examination and the acceptance of the thesis, the final oral examination will be held, not less than two weeks before Commencement.

For the Master's degree, the adviser will act as chairman of the examining committee, which will include all the instructors with whom the student has taken work, the thesis committee, and ex-officio, the head or chairman of the department in which the major work is done. Any member of the Graduate Faculty may attend as a visitor, and written notice



shall be sent by the chairman of the committee to all members of the Graduate Faculty in the major and minor departments. The final oral examination will cover all the work offered for the degree, and may include other work fundamental thereto. At the close of the examination, the committee will vote upon the candidate, taking into account all of his work. A majority vote is required for approval.

For the Doctor's degree, the committee conducting the final oral examination will consist of the adviser as chairman, of a majority of the members of the Graduate Faculty in the major department, and of at least three other members of the Graduate Faculty appointed by the Dean. At least one member of this committee shall be from a group other than the one in which the major department is included. This examination is to cover the field of knowledge represented by the major work, and shall not exceed three hours. The date of the final oral examination for the doctorate shall be publicly announced, and the examination shall be open to any member of the Graduate Faculty. Upon completion of the examination, a formal vote of the committee shall be taken and an affirmative vote of at least two thirds of the members shall be necessary for recommendation of the candidate for the degree.

11. *Recommendation by the Faculty.*—The Dean will report to the Graduate Faculty the names of those who have completed the requirements for the Master's and Doctor's degrees, and those duly approved will be recommended by the Faculty to the Board of Regents of the University. Unless excused by the Dean of the Graduate School and the President of the University, all candidates are required to be present at Commencement when the degrees are conferred.

#### CLINICAL AND CLASS WORK FOR VISITING OR RESIDENT PRACTITIONERS

In order that there may be no misunderstanding, it should be stated that the graduate work for a limited number described above in no way changes or modifies the opportunities for observation hitherto extended visiting physicians and surgeons by the Mayo Clinic in Rochester, or the arrangements offered in Minneapolis by the Medical School for practitioners who wish to attend such undergraduate medical classes as may be of profit to them without interfering with the regular work of the staff and students of the Medical School. Inquiries concerning these opportunities should be addressed to the Dean of the Medical School, Millard Hall, Minneapolis, Minn.



TABULAR SUMMARY OF REQUIREMENTS  
FOR THE MASTER'S DEGREE

WORK	UNDER THE DIRECTION OF	DATE
Program, major and minor	Adviser and Dean of the Graduate School.	On entrance.
Approval of thesis subject	Adviser and group committee....	November 15.
Language requirement...	Adviser and language department.	Before close of second quarter.
Approval of candidacy...	Executive Committee.....	Beginning of third quarter.
Filing of thesis.....	Dean of the Graduate School....	Six weeks before graduation.
Examination of thesis...	Thesis committee.....	Before admission to final oral examination.
Final written examination in major.....	Major department members of the Graduate Faculty.	Not later than four weeks before Commencement and before final oral.
Final oral examination on all work.....	Thesis committee; all instructors; head of major department.	Not later than two weeks before Commencement.

(Course examinations as required at the usual time.)

Fee for binding thesis.. Registrar ..... One week before Commencement.

(For the Master's degree in clinical subjects, the dates refer to the last year.)

TABULAR SUMMARY OF REQUIREMENTS  
FOR THE DOCTOR'S DEGREE

WORK	UNDER THE DIRECTION OF	DATE
<b>FIRST YEAR</b>		
Major .....	Adviser and Dean of Graduate	
Minor .....	School.	
<b>SECOND YEAR</b>		
Tentative program of entire second and third year's work.	Adviser, Medical Graduate Committee and Dean of Graduate School.	Before beginning work of second year.
Major, including thesis	As for tentative program.	
Minor .....	Adviser and minor department...	Before admission to preliminary examination.
Language .....	Adviser and language department.	
Recommendation ....	By major department.....	
Preliminary examination	Special committee .....	One calendar year before degree is to be conferred.
<b>THIRD YEAR</b>		
Major, including thesis	Adviser, Medical Graduate Committee and Dean of Graduate School.	Six weeks before graduation.
Filing of thesis.....	Dean .....	Before admission to final oral examination.
Examination of thesis..	Thesis committee.....	Four weeks before Commencement and before final oral examination.
Final written examination in major.	Major department members of the Graduate Faculty.	
Final oral examination	Adviser, majority of members of major department and other members appointed by Dean of Graduate school.	Not later than two weeks before Commencement.
Bond for publication of thesis	Registrar .....	Not later than one week before Commencement.

## DEPARTMENTAL STATEMENTS

The members of the Faculty at Rochester (Mayo Foundation) are indicated by an asterisk (\*) in the list at the head of each departmental statement. The courses given at Rochester are grouped separately, and the numbers given the special prefix "M." The suffixed f, w, s, and su indicate fall, winter, spring, and summer quarters, respectively. The hyphen indicates courses continuous through the quarters indicated. Suffixed letters separated by commas indicate the repetition of the course in the corresponding quarters. The courses numbered between 100 and 200 are less advanced in character and in some cases are open as electives to properly qualified undergraduates. The courses above 200 are primarily graduate in character, of the more advanced or research type.

The various divisions are grouped under the following departments:

1. Anatomy (including Histology and Embryology).
2. Bacteriology and Immunology.
3. Medicine (including General Medicine, Dermatology, and Mental and Nervous Diseases).
4. Obstetrics and Gynecology.
5. Ophthalmology and Oto-Laryngology.
6. Pathology.
7. Pediatrics.
8. Pharmacology and Therapeutics.
9. Physiology and Physiologic Chemistry.
10. Roentgenology.
11. Surgery (including General Surgery, Experimental Surgery, Orthopedic, and Urological Divisions).

### ANATOMY

Professors CLARENCE M. JACKSON, JOHN B. JOHNSTON, THOMAS G. LEE, RICHARD E. SCAMMON; Assistant Professor ANDREW T. RASMUSSEN.

The new institute of Anatomy offers excellent facilities to students who wish to take advanced work or to pursue investigations in anatomy.

The prerequisite work for all students who desire a major or minor in the Department of Anatomy includes general zoology (animal biology), six semester hours, and advanced zoology or elementary courses in anatomy (including histology, embryology, and neurology), six semester hours. In addition, each student who desires a major in anatomy must have had the elementary courses in that branch of anatomy in which he desires to specialize—gross anatomy, histology, embryology, or neurology. Students majoring in clinical subjects who desire a minor in anatomy must have had the courses in anatomy usually required of medical students (including Courses 103, 107, and 111). A reading knowledge of either French or German is required of students who desire a major in

anatomy for the Master's degree, and a reading knowledge of both French and German is required of those who are candidates for the Doctor's degree.

#### COURSES FOR UNDERGRADUATE AND GRADUATE STUDENTS

- 103s,su. **HUMAN HISTOLOGY.** A microscopic study of the various tissues and organs. Prerequisites: Animal Biology 1-2. Eight credits. SCAMMON.
- 107s,su. **HUMAN EMBRYOLOGY.** The development of the human body. Prerequisites: Anatomy 103, or equivalent. Five credits. SCAMMON.
- 111f,su. **HUMAN NEUROLOGY.** A study of the gross and microscopic structure of the central nervous system and sense organs of man. Prerequisites: Anatomy 103 and 107, or Animal Biology 7-8 or 19-20. Five credits. JOHNSTON, RASMUSSEN.
- 112f,w,s. **COMPARATIVE NEUROLOGY OF VERTEBRATES.** Prerequisites: Anatomy 111, or Animal Biology 19-20. JOHNSTON.
- 121f,s,su. **ANATOMICAL TECHNIQUE.** Lectures and laboratory work upon the principles and practice of Microtechnique. Prerequisites: Anatomy 103, or Animal Biology 7-8. Four credits. LEE.
- 129f-130w-131s. **TOPOGRAPHIC ANATOMY.** Based upon a study of cross-sections of the human body. Lectures and laboratory work. Prerequisites: Anatomy 5-6. Two credits (or more) each quarter. JACKSON.
- 133f,su. **ANATOMY OF THE FETUS AND CHILD.** A survey of prenatal and postnatal development. Fourth-, fifth-, or sixth-year medical, or graduate students. Limited to sixteen students. Prerequisites: Courses 5-6, 107. Sixty-six hours, four credits. SCAMMON.
- 134f,s,su. **ANATOMY OF THE NEWBORN.** A detailed laboratory study of the anatomy of the newborn. Fourth-, fifth-, or sixth-year medical, or graduate students. Prerequisites: Course 133, or equivalent. Sixty-six hours, three credits. SCAMMON.
- 135f,su. **PHYSICAL DEVELOPMENT OF CHILDHOOD.** Lectures, with study of illustrative material. Primarily for students in the College of Education; open to medical students by permission of instructor. Twenty-two hours, two credits. SCAMMON.
- 117f. **IMPLANTATION AND PLACENTATION.** A study of the implantation of the ovum, the formation of the placenta and the earliest stages of development in man and mammals. Prerequisites: Anatomy 102 or equivalent. Three credits (or less). LEE.
- 123f-124w-125s-126su. **ADVANCED ANATOMY.** Individual topics for advanced work in gross anatomy, histology, embryology, or neurology will be

assigned to students who have completed the elementary courses in the corresponding subjects. Special courses are arranged for clinical graduate students. JACKSON, JOHNSTON, LEE, SCAMMON, RASMUSSEN.

160f-162s-163su. SEMINAR IN GROWTH OF CHILDREN. A study with graphic analysis of data on physical development of children of school age. Prerequisites: Course 135, or equivalent. Hours and credits to be arranged. SCAMMON.

#### COURSES PRIMARILY FOR GRADUATE STUDENTS

201f-202w-203s-204su. RESEARCH IN ANATOMY. Qualified students may undertake the investigation of problems in anatomy, including histology, embryology, and neurology. Special facilities are offered to graduate students in the clinical departments for work upon problems in applied anatomy. JACKSON, JOHNSTON, LEE, SCAMMON, RASMUSSEN.

205f-206w-207s-208su. ANATOMICAL SEMINAR. Reviews of the current literature and discussion of research work being carried on in the Department. Reading knowledge of French and German required. JACKSON and staff.

### BACTERIOLOGY AND IMMUNOLOGY

Professors WINFORD P. LARSON, EDWARD C. ROSENOW; Associate Professor ARTHUR H. SANFORD; Assistant Professor ARTHUR T. HENRICI.

Graduate students who desire to take major or minor work in bacteriology must present credits in the following subjects: physics, eight semester credits; general and organic chemistry, twelve semester credits; zoology, six semester credits; and a reading knowledge of German.

Students who elect major work in bacteriology must present credits in general bacteriology or its equivalent.

#### A. COURSES OFFERED AT MINNEAPOLIS

104w,su. GENERAL BACTERIOLOGY. The preparation of culture media; the morphology of bacteria; methods of staining and identification; anaerobic bacteria; principles of sterilization and disinfection; examination of air, water, milk; relation of bacteriology to the industries. Prerequisites: general chemistry, and botany or zoology. Ninety-nine hours, six credits. LARSON.

105su,f. SPECIAL BACTERIOLOGY. The study of pathogenic bacteria, especially in relation to definite diseases; bacteriological methods in clinical diagnosis; principles of infection and immunity, with practical application of serum reactions. Prerequisites: general bacteriology. Seventy-seven hours; five credits. LARSON.

- \*114. **ADVANCED BACTERIOLOGY.** An advanced course giving additional work in bacteriology and the opportunity of working out special problems. Limited to ten students. Forty-four hours; two credits. LARSON.
- \*115. **IMMUNITY.** The study of natural and acquired immunity, including experiments to show the several types of protective substances and the principles and technique of serum diagnosis. Forty-eight hours; two credits. LARSON.
- \*117. **THE HIGHER BACTERIA.** Study of morphology, cultivation, and classification of trichomycetes, yeasts, and moulds. Study of the mycoses. Limited to six students. Fall quarter. Hours and credits to be arranged. HENRICI.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

- M155f-156w-157s-158su. **CLINICAL AND BACTERIOLOGIC LABORATORY SERVICE.** Routine clinical and special research work in hematology, serology, bacteriology, and parasitology. ROSENOW, SANFORD.
- M159f-160w-161s-162su. **CLINICAL BACTERIOLOGY AND PARASITOLOGY.** Making and examination of cultures; preparation and administration of autogenous vaccines; Wasserman tests; examination of stools and a study of internal parasites; special clinical laboratory methods, and opportunity for clinical or bacteriological research. SANFORD.
- M275f-276w-277s-278su. **EXPERIMENTAL BACTERIOLOGY.** Research in the bacteriology of normal and diseased tissues, the blood, secretions, and exudates. Experimental inoculation of animals and immunological studies. Study of the therapeutic value of dead bacteria. ROSENOW.

### MEDICINE

(Including General Medicine, Dermatology, and Nervous and Mental Diseases)

Professors ARTHUR S. HAMILTON, THOMAS B. HARTZELL, HENRY S. PLUMMER,\* LEONARD G. ROWNTREE, S. MARX WHITE; Associate Professors HERBERT Z. GIFFIN,\* ARCHIBALD H. LOGAN,\* WALTER D. SHELDON,\* JOHN H. STOKES,\* HENRY L. ULRICH; Assistant Professors WALTER M. BOOTHBY,\* GEORGE B. EUSTERMANN,\* ROBERT D. MUSSEY,\* Instructors DORR F. HALLENBECK, WILLIS S. LEMON, LEDA J. STACY, HENRY W. WOLTMANN.

The graduate work in the Department of Medicine is designed to prepare students for practice of the specialty of internal medicine, research in the problems of general medicine, and for the specialty of nervous and

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\* These elective courses are offered in one or more quarters. Elective programs will be issued each quarter.



mental diseases, as the case may be. Prospective students who have had no special work in addition to that of the undergraduate course in physiology, physiologic chemistry, therapeutics, experimental medicine, or pathology are advised to devote a year or more to these subjects before entering the regular three years' graduate course. In addition, it is recommended that a minor be carried throughout the course in one or more of the following departments: physiology, pharmacology, pathology, immunology, and pediatrics. For students specializing in nervous and mental diseases, minors in anatomy and psychology are especially valuable, and for those desiring it, a minor could be arranged in the Department of Ophthalmology and Oto-Laryngology, giving a special opportunity to study lesions of the eye occurring in systemic disorders. In the Medical School, during at least the third year of the three-year fellowship, the fellow acts as an officer of the clinic with definite responsibility in the care of patients in the University Hospital.

#### A. COURSES OFFERED AT MINNEAPOLIS

- 121f,w,s,su. **CLINICAL MEDICINE.** Study of physical diagnosis and methods of investigation and recording clinical data. The laboratory of experimental medicine is open for study of special problems arising in the investigation of cases. Emphasis placed on methods of treatment. ROWNTREE, WHITE.
- 122f,w,s,su. **DISEASES OF CARDIOVASCULAR APPARATUS.** Special study of diseases of the heart and blood-vessels, including technique and application of the polygraph, electrocardiograph, and interpretation of outlines of the heart and great vessels obtained by means of the radiogram and orthodiagram. WHITE.
- 123f,w,s,su. **PATHOLOGY OF THE NERVOUS SYSTEM.** The preparation of gross and microscopic material from diseased nerve tissues; the relations existing between pathologic lesions, signs, and symptoms; the chief neuron systems and principles underlying their degeneration. HAMILTON.
- 124f,w,s,su. **ADVANCED NEUROPATHOLOGY.** A course consisting of several hours of demonstrations in papillo-edema and work of similar character, with study of the microscopic sections, etc. Opportunity for individual work for any desired period. HAMILTON.
- 125f,w,s,su. **CLINICAL NEUROLOGY.** Advanced diagnosis of nervous diseases; practical experience in diagnostic procedures employed in the study of diseases of the nervous system. The diagnosis and treatment of syphilis of the central nervous system. HAMILTON.
- 126f,w,s,su. **NEUROLOGIC RESEARCH.** HAMILTON.
- 127f,w,s,su. **RESEARCH IN MOUTH INFECTIONS.** A study of dental and parodontal infections as related to systemic disease. Experimental study to determine the lesion produced in animals by bacteria from these sources. HARTZELL.

- 128f,s. MEDICAL CHEMISTRY. Chemical and metabolic studies in nephritis, diabetes, acidosis, diseases of the liver, etc., together with research work along biochemical lines. ROWNTREE.
- 129f,w,s,su. PROBLEMS IN MEDICINE. Specific problems in diagnosis and treatment, including problems in immunology viewed from the clinical standpoint. ULRICH.
- 130f,w,s,su. RESEARCH IN MEDICINE. ROWNTREE, WHITE.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

The work in diagnosis consists of history taking, physical diagnosis, the correlation of the various special examinations and the formation of an independent judgment concerning diagnosis, indications for medical and surgical treatment and recommendations, under the immediate direction of the chief of the section and his first assistant. A study of methods of investigation, the recording and tabulating of case records for special work and the study of special laboratory problems in connection with the sectional work is encouraged.

- 151f-152w-153s-154su. HEMATOLOGY, URINALYSIS, CLINICAL BACTERIOLOGY, AND PARASITOLOGY. SANFORD.
- 155f,w,s,su. GASTROLOGICAL LABORATORY. EUSTERMAN.
- 156f,w-157s,su. LABORATORY OR CLINICAL BACTERIOLOGY AND PARASITOLOGY. SANFORD.
- 158f,w-159s,su. LABORATORY OF HEMATOLOGY AND URINALYSIS. SANFORD.
- 160f-161w-162s-163su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to diseases of the gastro-intestinal and accessory digestive tracts. EUSTERMAN.
- 164f,w,s,su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to gynecology and radium therapy. STACY.
- 165f-166w-167s-168su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to diseases of the ductless glands, and the esophagus. PLUMMER, WILLIUS.
- 169f-170w-171s-172su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special reference to diseases of the blood and blood-forming organs. GIFFIN, HALLENBECK.
- 173f,w-174s,su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. With special references to diseases of the intestines. LOGAN.
- 175f,w-176s,su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS, with special reference to diseases of the chest. LEMON.
- 177f,w,s,su. PRACTICAL WORK IN NEUROLOGY AND PSYCHIATRY. SHELDON, WOLTMANN.

178f,w-179s,su. GENERAL MEDICAL AND SURGICAL DIAGNOSIS. MUSSEY.

251f,w,s,su. ADVANCED WORK IN ELECTROCARDIOGRAPHIC LABORATORY.  
PLUMMER, WILLIUS.

252f-253w-254s-255su. PRACTICAL AND RESEARCH WORK IN DERMATOLOGY.  
STOKES.

256f,w-257s,su. METABOLISM LABORATORY. Respiratory exchange, acidosis,  
and allied problems. PLUMMER, BOOTHBY.

For courses in pathology, physiologic chemistry, urologic diagnosis, diagnosis of diseases of the eye, ear, nose, and throat, orthopedic diagnosis, and roentgen plate reading, see announcements by the corresponding departments.

### OBSTETRICS AND GYNECOLOGY

Professor JENNINGS C. LITZENBERG; Associate Professor FRED L. ADAIR.

Of the courses in other departments open to graduate medical students, the following are especially recommended for those desiring to specialize in obstetrics and gynecology.

Advanced Anatomy; gross and histological, of the female generative organs (Anatomy 153f-154w-155s-156su).

Fetal Anatomy: dissection of fetus and new-born (Anatomy 133f and 134f,s,su).

Implantation and Placentation (Anatomy 137f,w,s).

Advanced Physiologic Chemistry (Physiology 153f,w,s,su).

Gynecological Pathology (Pathology 118s).

Experimental Pharmacology (Pharmacology 104, 109a,b).

Other courses in fundamental or clinical subjects may be elected.

The following graduate courses are offered in the Department of Obstetrics and Gynecology (at Minneapolis):

107f-108w-109s-110su. ADVANCED PATHOLOGY OF THE FEMALE GENERATIVE ORGANS. Required of first- or second-year fellows in obstetrics and gynecology. Prerequisite: Pathology 108, or equivalent. ADAIR.

111f-112w-113s-114su. CLINICAL OBSTETRICS AND GYNECOLOGY. A course in diagnosis and treatment, with special study of selected cases. Clinic in the Out-Patient Department of the University Hospital, M.W.F., throughout the year. Required of first-year fellows, and may be elected by second-year fellows.

115f-116w-117s-118su. CLINICAL OBSTETRICS AND GYNECOLOGY. Similar to Course 111-114, but on T.Th.S. Required of second-year fellows, and may be elected by first-year fellows.

- 119f-120w-121s-122su. **ADVANCED OBSTETRICS AND GYNECOLOGY.** Includes service in the University Hospital, affording ample opportunity for experience in diagnosis, care, and treatment (operative and non-operative) of patients. Special facilities offered for study of problems and cases of unusual interest. Required of first-year fellows. LITZENBERG.
- 123f-124w-125s-126su. Similar to Course 119-122, but more advanced, both in clinical and research aspects of the subjects, so as to be adapted to the increased training and experience. Required of second-year fellows. LITZENBERG.
- 127f-128w-129s-130su. Similar to Courses 119-122 and 123-126, but more advanced. Required of third-year fellows. LITZENBERG.
- 201f-202w-203s. **SEMINAR.** A conference of the staff, including the fellows and graduate students. Presentation and discussion of original work and reports upon the current literature in obstetrics and gynecology. Reading knowledge of French and German is necessary. LITZENBERG.
- 205f-206w-207s-208su. **RESEARCH.** Clinical and laboratory research upon problems in obstetrics and gynecology. Required of third-year fellows, who must complete a satisfactory thesis during the year. Elective for second-year fellows or other properly qualified graduate students. LITZENBERG, ADAIR.

## OPHTHALMOLOGY AND OTO-LARYNGOLOGY

Associate Professor WILLIAM R. MURRAY; Assistant Professors WILLIAM L. BENEDICT,\* FRANK E. BURCH, HAROLD I. LILLIE,\* GORDON B. NEW,\* HORACE NEWHART; Instructor ROY A. BARLOW.

The graduate courses in these subjects are designed to prepare selected men for advanced work in the various lines, to prepare them for practice in these specialties, and to develop research and productive work in these subjects.

Of elective courses in other departments, the following are highly desirable:

Physics of Light and Acoustics.

Advanced Optics.

Advanced Anatomy of the Head and Neck.

Topographic Anatomy of the Head and Neck.

Advanced Histology and Embryology of the Eye, Ear, Nose, and Throat.

Advanced Physiology of Vision and Hearing.

Physiologic Optics Seminar.

Special Pathology of the Eye, Ear, Nose, and Throat.

Immunity.

Advanced Neuropathology.

The following courses are offered within the Department:

A. COURSES OFFERED AT MINNEAPOLIS

- 131f,w,s,su. ADVANCED OPERATIVE SURGERY OF THE EYE. Demonstrations upon the cadaver and live and dead animal eyes, with the usual operative procedures of practical value. Each graduate student will perform all the usual operations upon the cadaver and animals. Two and one-half hours a week. MURRAY, NEWHART.
- 132f,w,s,su. ADVANCED OPERATIVE SURGERY OF THE NOSE AND THROAT. A course consisting of demonstrations upon the cadaver and the usual operative procedures of practical value. Each student will be given an opportunity to do work in the laboratory, performing all usual and practical operations. Two hours a week. MURRAY, NEWHART.
- 133f,w,s,su. ADVANCED OPERATIVE SURGERY OF THE TEMPORAL BONE. A course of eight to twelve hours consisting of demonstrations and exercises on the cadaver at the Institute of Anatomy. Limited to four students. MURRAY, NEWHART.
- 134f,w,s,su. OPERATIVE SURGERY ON THE LABYRINTH. A course consisting of lectures and practical demonstrations of diagnostic methods. Eight hours; Millard Hall. MURRAY, NEWHART.
- 135f,w,s,su. ADVANCED COURSE IN REFRACTION WORK. A course consisting of eight lectures and illustrated demonstrations upon the errors of refraction and motor anomalies, supplemental and practical work in out-patient clinic on the refraction work. MURRAY.
- 138f,w,s,su. ADVANCED OPHTHALMOSCOPY. Training in the use of the ophthalmoscope by (a) direct method, and (b) indirect method. Examination in detail of the normal fundus oculi. Diagnosis of abnormalities (a) in the media, (b) in the fundus oculi. MURRAY.
- 139f,w,s,su. ADVANCED OPHTHALMOLOGY. Three years' service in the wards and Out-Patient Department of the University Hospital with clinic and laboratory research. Those taking this course will act as assistants in out-patient clinics in operative and other clinical work. MURRAY and Assistants.
- 141f,w,s,su. ADVANCED OTO-LARYNGOLOGY. Three years' service in the wards of the University Hospital and Out-Patient Department with clinic and laboratory research. Those taking this course will act as assistants in out-patient clinics, in operative and other clinical work. MURRAY and Assistants.
- 145f,w,s,su. CLINICAL OPHTHALMOLOGY AND OTO-LARYNGOLOGY. Special half-time assistantship and service in the private clinic of Assistant



Professor Burch. A systematic course of assigned reading and study, with final examination, is included. For credit beyond one year, work in investigation must be included. BURCH.

201f,w,s,su. SEMINAR IN OPHTHALMOLOGY AND OTO-LARYNGOLOGY. Given by members of the staff and open to fellows, scholars, and other properly qualified graduate students. MURRAY, NEWHART.

203f,w,s,su. RESEARCH. Each graduate student will be required to pursue some line of original research in ophthalmology or oto-laryngology. MURRAY, NEWHART.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

M101f,102w-103s-104su. REFRACTION. Theory, diagnosis and treatment of refractive and muscular errors of the eye. Practical work on patients under supervision of the instructor. BENEDICT.

M105f-106w-107s-108su. CLINICAL OPHTHALMOLOGY. Theory and practice of diseases of the eye, including instruction in operative ophthalmology, ophthalmoscopy, and ophthalmology in general diagnosis. BENEDICT.

M109f-110w-111s-112su. CLINICAL OTOTOLOGY. Theory and practice with differential diagnosis of diseases of the ear, including instruction in operative otology, and the relations of diseases of the ear to nose and throat and to general diagnosis. LILLIE, BARLOW.

M113f-114w-115s-116su. CLINICAL RHINOLOGY AND LARYNGOLOGY. (a) Diagnosis and treatment of diseases of the nose, accessory sinuses, pharynx and larynx, including the diagnosis of surgical conditions of the face, jaws, mouth, and neck; (b) relation of nose, throat, and mouth to general diseases. LILLIE, BARLOW.

M117f-118w-119s-120su. EQUILIBRATION TESTS (BARANY). Clinical course for localizing brain lesions. Differential diagnosis. Lectures and clinical demonstrations. LILLIE, LYONS,

M121f-122w-123s-124su. LARYNGOLOGY, ORAL AND PLASTIC SURGERY. Diagnosis and treatment. Radium treatment of neoplasms of nose, throat, and mouth. Plastic surgery of face and mouth. NEW.

NOTE: For courses in pathology of the eye, ear, nose, and throat, see announcement of the Department of Pathology.

#### PATHOLOGY

Professors HAROLD E. ROBERTSON, LOUIS B. WILSON;\* Associate Professors ELEXIOUS T. BELL, WILLIAM C. MACCARTY;\* Assistant Professor WAYNE W. BISSELL.\*

Graduate students who desire to take their major or minor work in pathology must present credits in the following subjects: physics, eight credits; general and organic chemistry, twelve credits; zoology, six credits; and a reading knowledge of German.

In addition, students who elect their major work in pathology must present credits for the equivalent of the first two years' work of the Medical School of this University.

#### A. COURSES OFFERED AT MINNEAPOLIS

- 101f,w. PATHOLOGY, PART 1. General principles governing pathologic changes, including disturbances of the circulation and metabolism; inflammation, regeneration, and repair; tumor formation. The study and recognition of gross microscopic lesions. Prerequisites: histology and special bacteriology. One hundred sixty-four hours; nine credits. ROBERTSON, BELL.
- 102w,s. PATHOLOGY, PART 2. The study of the pathologic processes of infectious diseases, such as diphtheria, typhoid fever, etc.; the special pathology of lesions in various organs, systems of organs, and tissues of the body. Prerequisites: pathology, part 1. One hundred sixty-four hours; nine credits. ROBERTSON, BELL.
- 107su,w. PREVENTIVE MEDICINE AND HYGIENE. A systematic study of the principles of personal and communal hygiene and of general procedures for the protection of the public health. Thirty-three hours; three credits. SUNDWALL.
- \*108. ADVANCED CLINICAL PATHOLOGY. Practical studies on spinal fluids, including colloidal gold and Nonne reactions, and other special methods for examination and diagnosis of body tissues and fluids. Prerequisites: clinical pathology. Thirty-three hours; one and one-half credits. WARWICK.
- \*110. PRACTICAL WORK IN HISTOPATHOLOGY. Exercises in examination of microscopic material from autopsies and operations. Prerequisites: pathology, parts 1 and 2. Hours arranged with instructor.
- \*117. DIAGNOSIS OF TUMORS. Rapid diagnosis and study of tumors and other pathologic conditions simulating tumor formation. Prerequisites: pathology, parts 1 and 2. Thirty-three hours; one and one-half credits. BELL.
- \*118. GYNECOLOGIC PATHOLOGY. The special study of pathologic conditions found in the female genital tract. Prerequisites: pathology, parts 1 and 2. Thirty-three hours; one and one-half credits. BELL, ADAIR.

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\* Elective courses offered in two, three, or four quarters. Special programs issued for each quarter.

- \*119. CLINICAL PATHOLOGICAL CONFERENCE. Presentation and comparison of clinical data on selected cases by clinicians and of the pathologic specimens from these same cases, by the pathologist, with discussions of the problems of etiology and diagnosis. One hour per week, in each quarter.
- \*123. SURGICAL PATHOLOGY. Studies in the gross and microscopic characters of surgical material with conferences on and discussion of practical questions of etiology, diagnosis, and treatment. Prerequisites: pathology, parts 1 and 2. Thirty-three hours; one and one-half credits.
- \*201. RESEARCH. Graduate students of the necessary preliminary training may elect research in pathology, either as a major or minor subject. Hours and credits to be arranged. ROBERTSON, BELL.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

The graduate course in pathology is designed to prepare selected men for diagnostic and research work in pathology.

The graduate courses in bacteriology are open to students with previous training in bacteriology, holding only their Baccalaureate or Master's degrees in arts or science, as well as to graduates in medicine. They are designed to train well-equipped students for special work in bacteriologic diagnosis and research, and for the teaching of bacteriology.

The graduate courses in bacteriology are open also as minor courses to fellows in surgery, medicine, etc.

- M151f-152w-153s-154su. PATHOLOGIC DIAGNOSIS OF SURGICAL SPECIMENS AT OPERATION. Gross and microscopic study of fresh tissues. MACCARTY, BRODERS.
- M155f,w-156s,su. NECROPSY SERVICE. Junior assistant (three months); senior assistant (three months); demonstrator of pathology in clinico-pathologic conference (three months); microscopic examination of fixed tissue removed at necropsies and operation. BISSELL.
- M225f,w-226s,su. SPECIAL PATHOLOGY OF THE BONES AND JOINTS. Gross and microscopic study of lesions of bones and joints; research work on assigned problems in pathologic anatomy. WILSON.
- M257f-258w-259s-260su. SPECIAL PATHOLOGY OF THE GENITO-URINARY ORGANS. Animal experimentation; research on assigned problem. WILSON, MANN.
- M261f-262w-263s-264su. SPECIAL PATHOLOGY OF THE MOUTH, NOSE, AND THROAT. Research work on assigned problem in the pathology of lesions of the mouth, nose, and throat. WILSON.

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\* Elective courses offered in two, three, or four quarters. Special programs issued for each quarter.

- M265f-266w-267s-268su. SPECIAL PATHOLOGY OF THE GASTRO-INTESTINAL TRACT. Research work on assigned problem. WILSON.
- M269f-270w-271s-272su. SPECIAL PATHOLOGY OF THE EYE AND EAR. Research work on assigned topic in the pathology of diseases of the eye and ear. WILSON.
- M273f-274w-275s-276su. SPECIAL PATHOLOGY OF THE NERVOUS SYSTEM. Research work on assigned problem. WILSON.
- M277f-278w-279s-280su. RESEARCH ON ASSIGNED PROBLEMS IN GENERAL PATHOLOGY, MORPHOLOGICAL AND EXPERIMENTAL. WILSON, MANN.
- M281f-282w-283s-284su. RESEARCH STUDIES UPON THE ETIOLOGY OF NEOPLASMS. Work assigned. MACCARTY, BRODERS.
- M285f-286w-287s-288su. RESEARCH IN CLINICO-PATHOLOGIC STANDARDIZATION. Work assigned. MACCARTY.
- M289f-290w-291s-292su. GROSS AND MICRO-PHOTOGRAPHY FOR SCIENTIFIC AND RESEARCH PURPOSES. WILSON.

NOTE: For course in applied pathology, see announcement of the Department of Surgery.

## PEDIATRICS

Professor JULIUS P. SEDGWICK; Associate Professor WALTER R. RAMSEY; Assistant Professors EDGAR J. HUENEKENS, ROOD TAYLOR.

The graduate work of the Department of Pediatrics is arranged with the intention (a) of preparing students to become competent pediatricists; (b) to put them in position to attack original pediatric problems; and (c) to make them competent teachers in the subject.

As a prerequisite a general understanding of physiologic and analytic chemistry and a working knowledge of French and German are essential.

Prospective students will find preparatory study in physiology and quantitative analysis of value.

Students will be encouraged to carry a minor in some of the fundamental branches.

## COURSES OFFERED AT MINNEAPOLIS

The following electives in other departments are desirable. (For further information see description of courses under departmental headings.)

Quantitative Analysis.

Organic Chemistry.

Physical Chemistry.

Mental Retardation.

Physiologic Chemistry

- Physiology of Muscle, Nerve, Blood, Circulation, and Digestion.  
 Physiology of the Nervous System and Special Senses: Respiration,  
 Metabolism, Nutrition, and Excretion.  
 Physical Chemistry of Cells.  
 Electro-Physiology.  
 Metabolism.  
 Quantitative Methods.  
 Human Neurology.  
 Fetal Anatomy  
 General Roentgenologic Technique.  
 Interpretations of Roentgenologic Findings.  
 Hematology.  
 Course in Immunity.  
 The Physiological and Chemical Basis of Pharmacology (Pharmacology 113a,b.).  
 Diseases of Cardiovascular Apparatus (Medicine 123-124).  
 Medical Chemistry.  
 Orthopedic Service.  
 Orthopedic Diagnosis.  
 Advanced Ophthalmoscopy.
- 103f,w,s,su. CLINIC IN PEDIATRICS. Conducted at the University Hospitals and Minneapolis City Hospitals; a part of course in required clinics. Sections of class. Fifth year. Eleven hours. SEDGWICK, HUENEKENS, RODDA, and Assistants.
- 104f,w,s,su. CONTAGIOUS DISEASES. The advanced study of contagious diseases, including the practice of intubation and tracheotomy, with training upon the cadaver.
111. DISEASES OF THE NEW-BORN.
115. THEORY AND PRACTICE OF INFANT FEEDING, including diseases of the gastro-intestinal tract.
117. PEDIATRIC CLINIC. Out-Patient clinic; University Hospital.
142. PREPARATION OF INFANT FOODS. Practical work.
144. CONTAGIOUS DISEASES. Advanced study of contagious diseases.
- 200-201. ADVANCED STUDY IN DISEASES OF INFANTS AND CHILDREN.
- 202-203. RESEARCH IN DISEASES OF NEW-BORN. Students undertaking this work should have had the equivalent of Anatomy 115 and Pediatrics 111.
- 204-205. RESEARCH IN PHYSIOLOGY OF NEW-BORN. Prerequisites: General Pathology and Pediatrics 111. Prerequisite preparation in physiology will depend upon the type of work undertaken.



- 206-207. RESEARCH IN DISEASES OF INFANTS AND GROWING CHILDREN. Prerequisite work will depend upon the type of work undertaken.
- 208-209. RESEARCH IN PHYSIOLOGY OF INFANTS AND GROWING CHILDREN. Prerequisite preparation will depend upon the type of work undertaken (Physiology 203-204 or 205-206).
- 210-211. RESEARCH IN ANATOMY OF INFANTS AND GROWING CHILDREN. Prerequisite preparation will depend upon the type of work undertaken.

### PHARMACOLOGY AND THERAPEUTICS

Professor ARTHUR D. HIRSCHFELDER; Associate Professor EDGAR D. BROWN.

- 102s,f. GENERAL PHARMACOLOGY. The principles underlying the structure, physico-chemical properties, physiologic, therapeutic, and toxic actions of substances, natural or synthetic, used as medicines. At least one quarter of physiology is prerequisite. Thirty-three hours. HIRSCHFELDER, BROWN.
- 104s,f. EXPERIMENTAL PHARMACOLOGY. Exercises illustrating the preparation and actions of medicine, their relation to chemical structure and their mode of administration. At least one quarter of physiology is prerequisite. Sixty-six hours. HIRSCHFELDER, BROWN.
- 105su,f or w,s. GENERAL PHARMACOLOGY AND THERAPEUTICS. A more detailed study of drugs important in clinical practice, covering the relations of chemical structure to physiologic and therapeutic action and modes of application in clinical medicine. Sixty-four hours. HIRSCHFELDER, BROWN.
109. PHARMACOLOGICAL PROBLEMS. Special investigation and experimental study of one or more of the following topics: anesthetics; circulatory stimulants and depressants; drugs acting upon the kidneys; urinary antiseptics; poisons and antidotes; effects of common harmless drugs; internal secretions; action of drugs upon parasites, tumors, etc. Hours and credits by arrangement. HIRSCHFELDER, BROWN.
110. POISONS. Their detection, actions, and antidotes. Forty-eight hours. BROWN.
112. PRACTICAL MATERIA MEDICA. The study of crude drugs, pharmaceutical preparations, and the flavoring and compounding of prescriptions. Eight hours. BROWN.
- 113f. THE PHYSIOLOGICAL AND CHEMICAL BASIS OF PHARMACOLOGY. The relation of drug action to chemical structure; the mode of action and therapeutic application of various synthetic drugs; the study of

chemotherapy. An adequate training in chemistry is prerequisite. Thirty-three hours. HIRSCHFELDER.

201f-202w-203s-204su. SEMINAR IN PHYSIOLOGY AND PHARMACOLOGY. Reviews of recent literature bearing upon physiologic and pharmacologic subjects. Conducted by department directors, with the collaboration of the staffs and of qualified graduate or undergraduate students. Thirty-two hours.

205f-206w-207s-208su. RESEARCH IN PHARMACOLOGY. HIRSCHFELDER, BROWN.

### PHYSIOLOGY AND PHYSIOLOGIC CHEMISTRY

Professors ELIAS P. LYON, FREDERICK H. SCOTT; Associate Professors RICHARD O. BEARD, EDWARD C. KENDALL,\* JESSE F. MCCLENDON; Assistant Professors FRANCIS B. KINGSBURY, CHAUNCEY J. V. PETTIBONE.

The Department of Physiology is well equipped for the various types of physiologic investigation. The library facilities are good.

For a minor or major in Physiology, good courses in general zoology, general chemistry, organic chemistry, and college physics, are prerequisites. (In exceptional cases high-school physics may be accepted for a minor.) Physical chemistry is desirable.

For a minor or major in physiologic chemistry, general and organic chemistry are prerequisite, and physical chemistry is desirable.

In addition, each student majoring in physiology or physiologic chemistry must have had the general courses, Physiology 101, 102, 103, 104, or the equivalent.

Students majoring in clinical subjects, and who desire to minor in physiology or physiologic chemistry, must have had the courses in these branches usually required of medical students.

A reading knowledge of German or French is required of candidates for the Master's degree in this Department, and a reading knowledge of both French and German, of candidates for the Doctor's degree.

#### A. COURSES OFFERED AT MINNEAPOLIS

100f-101w-102s. PHYSIOLOGIC CHEMISTRY. The components of the animal body; foods, digestion, the excreta and metabolism. Third-year medical students and others. Prerequisites: organic chemistry. One hundred and eighty-eight hours; nine credits. PETTIBONE, KINGSBURY, and Assistants.

103f,su. PHYSIOLOGY OF MUSCLE, NERVE, BLOOD, CIRCULATION, AND DIGESTION. Fourth-year medical students and others. Prerequisites: organic chemistry and animal biology. One hundred and twenty-one hours; six quarter credits. SCOTT, MCCLENDON, and Assistants.

104w,su. PHYSIOLOGY OF THE NERVOUS SYSTEM AND SPECIAL SENSES: RESPIRATION, METABOLISM, NUTRITION, AND EXCRETION. Fourth-year

medical students and others. Prerequisites: organic chemistry and animal biology. One hundred and twenty-one hours; six quarter credits. LYON, SCOTT, BEARD, McCLENDON, and Assistants.

## ELECTIVE COURSES

- 110f. PHYSICAL CHEMISTRY OF VITAL PHENOMENA. Osmotic pressure surface tension, electric conductivity, hydrogen-ion concentration. Prerequisites: animal biology and two courses in chemistry. Sixty-six hours; three quarter credits. McCLENDON.
- 111w. ELECTRO-PHYSIOLOGY. The bio-electric currents, negative osmose, and further work on hydrogen-ion concentration. Prerequisites: 110f or arrange. Sixty-six hours; three quarter credits. McCLENDON.
- 112s. VITAMINES. Physico-chemical conditions necessary for the preservation of the vitamins during the storage and cooking and other preparation of foods. Prerequisites: 111w or arrange. Sixty-six hours; three quarter credits. McCLENDON.
- 113f,w,s,su. PROBLEMS IN PHYSIOLOGY. Arranged by instructors with qualified students. Each student will be assigned a topic for special laboratory study, leading in some cases to original investigation. Conference and reading. Prerequisites: Course 103-4 or its equivalent. Sixty-six hours; three quarter credits, or more. LYON, SCOTT, McCLENDON.
- 131w. ADVANCED PHYSIOLOGY OF MUSCLE, BLOOD, CIRCULATION AND DIGESTION. Alterations due to physiological conditions. Fourth-, fifth- or sixth-year medical students and others. Prerequisite: 103. Sixty-six hours; three quarter credits. SCOTT.
- 132s. ADVANCED PHYSIOLOGY OF RESPIRATION, EXCRETION, METABOLISM, NERVOUS SYSTEM AND SENSE ORGANS. Conference and laboratory work. Fourth-, fifth-, or sixth-year medical students and others. Prerequisites: 104. Sixty-six hours; three quarter credits. SCOTT.
- 153f,w,s,su. ADVANCED PHYSIOLOGIC CHEMISTRY. Course arranged by instructors with qualified students for special work. Fourth-, fifth-, or sixth-year medical students and others; may be taken one or more quarters. Prerequisites: Course 102. Sixty-six hours; arrange hours and credits. PETTIBONE, KINGSBURY.
- 161f. URINALYSIS. Advanced methods. Fourth-, fifth-, or sixth-year medical and other qualified students. Prerequisites: Course 102. Sixty-six hours; three quarter credits. PETTIBONE.
- 162w. CHEMICAL ANALYSIS OF BLOOD. Students will be given training in the most recent methods for the chemical analysis of blood including total nitrogen, total non-protein nitrogen, urea, uric acid, creatinine, cholesterol, chloride, sugar, and various other constituents. Prerequisites: Course 102. Sixty-six hours; three quarter credits. Course limited to twelve students. PETTIBONE.

- 163s. METABOLISM. Lectures and laboratory work on special phases of metabolism. Lectures may be taken alone; number of students unlimited; laboratory course limited to ten students. Fourth-, fifth-, or sixth-year medical students and others. Prerequisites: Course 102. Sixty-six hours; one and one-half or three quarter credits. PETTIBONE.
- 163f,w,s. QUANTITATIVE METHODS. The estimation of certain important substances in the urine, blood, and other body fluids. Fourth-, fifth-, or sixth-year medical students and others. Prerequisites: Course 102. Arrange hours and credits. KINGSBURY.
- 201f,w,s. SEMINAR IN PHYSIOLOGY AND PHARMACOLOGY. For instructors and advanced students. Eleven hours, each quarter; one quarter credit. LYON, HIRSCHFELDER, and Staff.
- 203f,w,s. RESEARCH IN PHYSIOLOGY. Hours and credits arranged. LYON, SCOTT, McCLENDON.
- 205f,w,s. RESEARCH IN PHYSIOLOGIC CHEMISTRY. Hours and credits arranged. KINGSBURY, PETTIBONE.
- 208f-209w. SEMINAR IN PHYSIOLOGIC OPTICS. Primarily for graduate students. Open to sixth-year medical students. Eleven hours; one quarter credit, each quarter. LYON.
- 210f-211w. PHYSIOLOGIC OPTICS. A laboratory course. For graduate and sixth-year students. Twenty-two hours; one quarter credit each quarter. LYON.

#### B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

- M251f-252w-253s-254su. PHYSIOLOGIC CHEMISTRY. Research work in problems related to metabolism; includes training in the use of methods of organic and inorganic analysis. KENDALL.

NOTE: For course in applied physiology, see announcement of the Department of Surgery.

### ROENTGENOLOGY

Professor RUSSELL D. CARMAN;\* Assistant Professor ALEXANDER B. MOORE.\*

The course in roentgenology is designed to prepare selected men for advanced work in this specialty. Unless the prospective student's preparation in normal anatomy, physiology, and pathology has been unusually good, at least a year should be spent in intensive study of these subjects before entering on the special three years' course.

- M151f,w,s,su. GENERAL ROENTGENOLOGIC TECHNIQUE. Roentgenography; plates, intensifying screens, developers; stereoscopy; roentgenoscopy; vertical, horizontal. CARMAN, MOORE.

- M155f,w,s,su. SPECIAL APPLICATION OF ROENTGENOLOGY. The osseous system, chest and lungs, urinary system, pyelography; gastro-intestinal tract. CARMAN, MOORE.
- M159f,w,s,su. ROENTGEN THERAPY. Superficial, deep; technique; apparatus; filters; dosage and measurements; cross firing; protection. CARMAN, MOORE.
- M163f,w,s,su. DANGERS OF THE ROENTGEN RAY. Effect upon tissues, normal and pathologic; protection, operator, patient; roentgen dermatitis, cause, results, treatment. CARMAN, MOORE.
- M251f,w,s,su. ELECTROPHYSICS. Electricity and magnetism, phenomena, nature, and properties; source of electric energy; types of currents, continuous and alternating; units of electric measurement; resistance; Ohm's Law; voltage, amperage, and wattage; the static machine; the induction coil; interrupters; condensers; the interrupterless transformer. CARMAN, MOORE.
- M255f,w-256s,su. PHYSICS OF THE ROENTGEN RAY. History, nature, and phenomena; the vacuum tube; the roentgen tube; types, penetration, measurements. CARMAN, MOORE.
- M257f,w-258s,su. INTERPRETATION OF ROENTGENOLOGIC FINDINGS. Normal, abnormal; roentgen signs of disease, direct, indirect; correlation of plate and screen observations; correlation of clinical and roentgen findings. CARMAN, MOORE.

## SURGERY

(Including General Surgery, Experimental Surgery, Orthopedic, and Genito-Urinary Divisions)

Professors WILLIAM F. BRAASCH,\* ARTHUR J. GILLETTE, CHARLES H. MAYO;\* Associate Professors DONALD C. BALFOUR,\* J. FRANK CORBETT, MELVIN S. HENDERSON,\* EDWARD S. JUDD,\* ARTHUR A. LAW, ARTHUR T. MANN, FRANK C. MANN,\* WALTER E. SISTRUNK,\* ARTHUR C. STRACHAUER; Assistant Professors BOYD S. GARDNER,\* EMIL S. GEIST, JAMES C. MASSON,\* Instructors JOHN L. CRENSHAW,\* HENRY W. MEYERDING.\*

- 101f,w,s. ADVANCED MINOR SURGERY. The student is required to assist in the dispensary (out-patient) surgical clinic, and in this connection makes a special study of the diagnosis and treatment of selected cases. STRACHAUER, JOHNSON.
- 102f,w,s. OPERATIVE SURGERY ON THE CADAVER. The technic of abdominal incision and closure; of bowel suturing, appendix removal, kidney exploration, nephrotomy, tracheotomy, amputations, ligations, etc. Graduate students act as laboratory assistants, and may work out



upon the cadaver various independent problems in emergency surgery. CORBETT, POPPE.

103f,w,s. EXPERIMENTAL SURGERY. A study of surgical technique by cardinal operations upon animals. CORBETT, POPPE.

104w. LOCAL ANESTHESIA. Methods and application of local anesthesia in both major and minor surgery. STRACHAUER.

105f,w,s. PROCTOSCOPY AND SIGMOIDOSCOPY. The treatment of the pathological conditions found in the lower bowel, including minor surgical operations. STRACHAUER, FANSLER.

201w,s. SURGERY OF THE KIDNEY. Review of the embryology, anatomy, and pathology. Diagnosis, cystoscopic study, including kidney function estimation and pyelography. Operative technique. Study of special problems involved. STRACHAUER.

204w,s. SURGERY OF THE BRAIN AND SPINAL CORD. Operative technique. Study of special problems involved. Prerequisites: Anatomy 103, Medicine 125. STRACHAUER.

205f-206w-207s. SURGICAL DIAGNOSIS. In this course the graduate student assists in the practical instruction of the clinical clerks and internes in the University Hospital, and makes a special study of problems in surgical diagnosis. STRACHAUER, et al.

208f-209w-210s. SURGICAL SERVICE. The graduate student acts as house surgeon, and in connection with the service is required to make a special study of the patients, preparing them for clinics and observing them after operations. STRACHAUER, et al.

211f-212w-213s. OPERATIVE SURGERY. In this course the surgical fellow acts as first assistant at all operations by the surgical staff in University Hospital. When properly qualified, the fellow will be permitted to operate, beginning with simpler surgical procedures. STRACHAUER, LAW.

214f,w,s. ORTHOPEDIC SERVICE. Three months' service as house surgeon in the State Hospital for Crippled and Deformed Children at Phalen Park. Special facilities for the study of orthopedic diagnosis and treatment. GILLETTE.

215f,w,s. ORTHOPEDIC DIAGNOSIS AND TREATMENT. History taking, physical examination, treatment, application, and use of plaster of Paris and braces. Graduate student acts as assistant in the clinic. GEIST.

216f,w,s. SURGICAL RESEARCH. Properly qualified students may undertake original investigation of problems in either experimental or clinical surgery. The work may be used for thesis purposes. STRACHAUER, CORBETT, LAW.

217f,w,s. SURGICAL SEMINAR. Conferences for reports on surgical literature, with presentation and discussion of specially interesting cases and research work by members of the surgical staff. STRACHAUER.

B. COURSES OFFERED AT ROCHESTER (MAYO FOUNDATION)

M151f-152w-153s-154su. EXPERIMENTAL SURGERY. The purpose of this course is to develop technique for special operative work. Open to fellows in surgery. MANN.

M155f-156w-157s-158su. POST-OPERATIVE CARE OF PATIENTS. Treatment of complications, surgical and medical. SISTRUNK.

M159f-160w-161s-162su. OPERATIVE SURGERY. Second assistantship in operating rooms; occasional substitute service as first assistant. Total service, one year general surgery. MAYO, BALFOUR, JUDD, SISTRUNK, PEMBERTON, ADSON, HEDBLUM.

Regular first assistants on surgical service in the Mayo Clinic will be selected from men who have completed the three years' fellowship service in general surgery.

M163f-164w-165s-166su. SURGERY OF THE ABDOMINAL ORGANS AND THE DUCTLESS GLANDS. Operative technique; study of special problems involved. MAYO.

M167f-168w-169s-170su. SURGERY OF THE ABDOMINAL AND GENITO-URINARY ORGANS. Operative technique; study of special problems involved. JUDD.

M171f-172w-173s-174su. SURGERY OF THE GASTRO-INTESTINAL TRACT AND PELVIC ORGANS. Operative technique; study of special surgical problems. BALFOUR.

M175f-176w-177s-178su. SURGERY OF THE THORACIC ORGANS. Operative technique; study of special problems involved. HEDBLUM.

M179f,w,s,su. ORTHOPEDIC DIAGNOSIS. History-taking and physical examination of orthopedic cases. HENDERSON, MEYERDING.

M171f,w,s,su. ORTHOPEDIC TECHNIQUE. Study of braces, material and construction, measurement and fitting; application and use of plaster of Paris; radiography of orthopedic cases; care of non-surgical orthopedic cases. HENDERSON, MEYERDING.

M173f-174w-175s-176su. ORTHOPEDIC SURGERY. One year of service is offered for those desiring special training in orthopedic surgery, six months in diagnosis and six months in surgery. In addition a three-year service is available for men who intend to make a specialty of orthopedic surgery, their work being of the same advanced character.

M177f,w-178s,su. UROLOGIC DIAGNOSIS. Cystoscopic examination and history-taking in diseases of the genito-urinary tract. BRAASCH, CRENSHAW.

M179f,w-180s,su. CYSTOSCOPY, PROCTOSCOPY, AND URETHROSCOPY. Cystoscopy and proctoscopic examination; pyelography; intravesical operations; fulguration. BRAASCH, CRENSHAW.

One year or more of service is offered as a part of a three-year Fellowship for those desiring to specialize in urology; three months' service for those desiring a limited training in urology as part of a general course in surgical diagnosis.

M181f,w,s,su. ROENTGEN PLATE READING. With special reference to cystoscopy (daily). Open to fellows in the department. BRAASCH.

M182f,w-183s,su. APPLIED PHYSIOLOGY. Experimental physiology as applied to surgical problems. Open to fellows in surgery, medicine, and pathology. MANN.

M184f,w-185s,su. APPLIED PATHOLOGY. Experimental pathology as applied to surgical problems. Open to fellows in pathology, medicine, and surgery. MANN.

M255f-256w-257s-258su. SURGICAL RESEARCH. Investigation of special problems in surgery. Open only to fellows of the department. MANN.

M259f,w,s,su. SURGICAL RESEARCH. Investigation of problems in various divisions of general surgery and surgical specialties. Staff.

M260f,w,s,su. SURGICAL SEMINAR. Conference for the discussion of original work, problems, and surgical literature. Staff.

M261f,w,s,su. SEMINAR IN ORTHOPEDIC SURGERY. Open to fellows of the Department. (Weekly.) HENDERSON.

Work is also offered at Rochester in dental surgery under Dr. Boyd S. Gardner.

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NOTE: For courses in surgical anatomy, pathology, clinical diagnosis, surgery of the eye, ear, nose, and throat, and roentgen plate reading, see announcements of corresponding departments

NOTE: For courses in applied pathology, see announcement of the Department of Surgery.